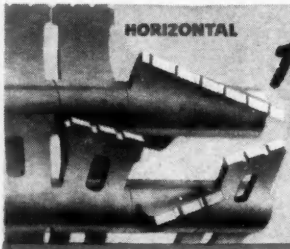
The Chemical Age

VOL LXIV 10 MARCH 1951 No 1652



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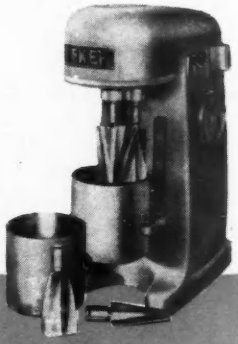

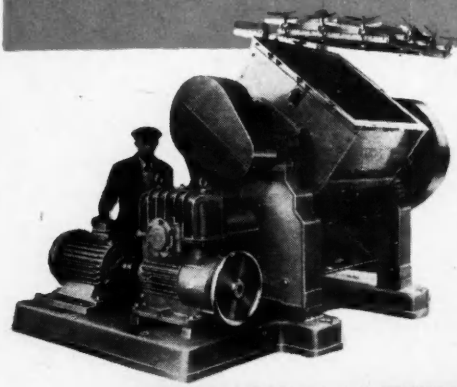

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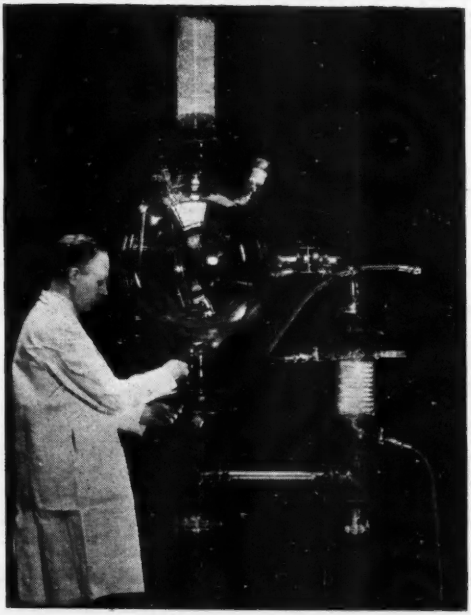

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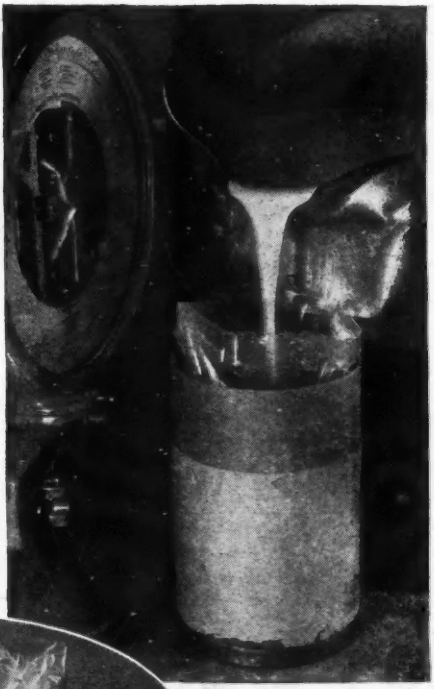

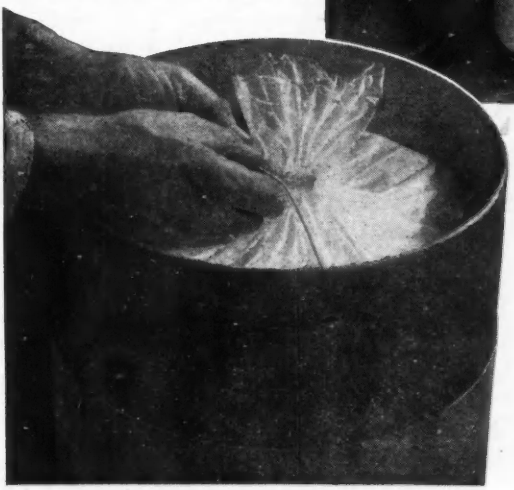

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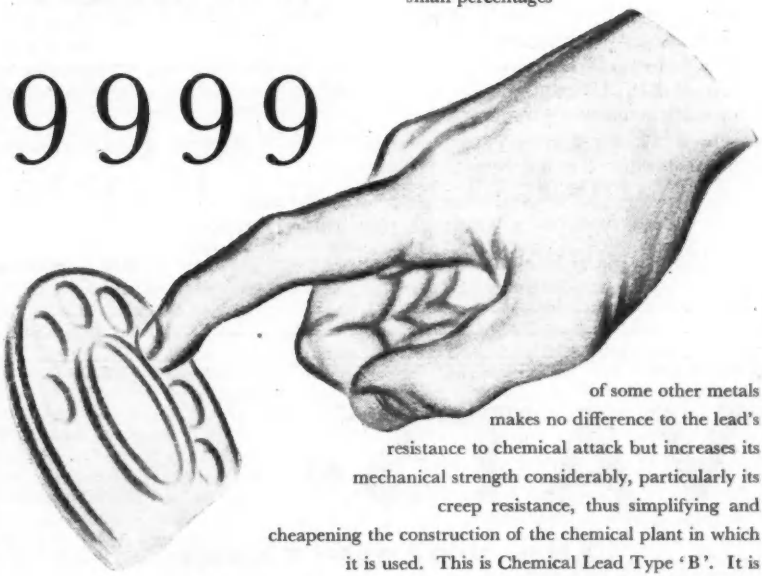

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Volume LXIV 10 March 1951 Number 1652

Scarce Chemicals & Controls

LAST week's debate in the Commons on raw material scarcities may have caused political flutterings, but the four-vote gap between the musterings of the whips will not make much difference to the manufacturer seeking elusive commodities in a rising market. Party politics seem somewhat remote when the present-day shortages of materials like sulphur and the non-ferrous metals are considered. Although required so diversely in our industries, supplies of materials like these, largely or wholly produced abroad, are outside the control of domestic politics. Mr. Harold Wilson's grim warning on scarcities was realistic enough. So, too, was his indication that numerous controls would have to enter the industrial pattern, for even a change in the saddle at Westminster will not significantly alter the facts that call for controls, voluntary or statutory. Countries producing vital raw materials are unlikely to accept international control or guidance of distribution unless the consuming countries also control their internal distribution. No material provides a better or clearer example of this than sulphur. There is strongly-voiced resentment in U.S. industry about even the present and reduced exports to Europe. If Europe is to secure larger allocations, it will be only through the argument that defence progress and essential production will be jeopardised without them. And extra sulphur in response to such pleas means, at any rate for a year or two, less for American users. In such circumstances, a non-essential use of sulphur in a consuming country would be bitterly resented. Indeed, not the least difficult problem to solve is the use of sulphur in producing British chemicals for export—particularly should business be secured in competition with an American manufacturer whose allocation of Texas sulphur has been cut!

It is inevitable that some scheme of priorities and allocations must determine the distribution within a consuming country of any essential material whose world distribution is settled by international controls or inter-governmental agreement. It would be politically inept to imagine that this need for controls is significantly related to party politics at home.

In the United States controls are already invading the chemical industry on a wide front. Perhaps for the immediate moment 'pressure-guidance' is a fairer description of the powers of the National Production Authority's Chemical Division, but no one supposes that detailed and statutory control orders will

be long delayed. Any temporary looseness of control is due to the facts that an expert NPA organisation has had to be built up and also that shortages have manifested themselves so quickly. Six months ago the NPA could place any chemical under its 'guidance' by declaring it to be a 'Schedule A' or scarce material. This brought such chemicals under anti-hoarding and systematic allocation regulations. Some of the chemicals affected up to last month were sulphur, benzene, chlorine, carbon tetrachloride, dichloro-benzenes, methanol, industrial alcohol, methyl and methylene chlorides, ethyl cellulose, polyethylene, styrene and polystyrene, trichloroethylene, and titanium pigments. Several metals, minerals, and raw materials, such as natural or synthetic rubbers, pulpwoods and paper, have also been scheduled as scarce and therefore placed under the ægis and rising powers of NPA. What follows in the way of guidance or control when a particular chemical is scheduled appears to depend upon the current facts of shortage and demand. Thus, when chlorine was scheduled in January, an order followed within a fortnight requiring producers or distributors to meet all orders for water and sewage treatment up to 100 per cent of 1950 deliveries, but not to deliver more than 25 per cent to any consumer in one month; also, not more than 10 per cent of production in any one month was to be turned over to defence orders. Ethyl cellulose producers, however, were required to divert 40 per cent to defence orders. One of the problems of NPA control already sharply encountered is the uneven distribution of defence orders among the producers of scarce chemicals. The regulation of distribution between normal and defence channels can be laid down by percentages on paper, but the pattern of trade and tenders assumes another shape. This is perhaps largely due to the difficulty of attempting quantity control without the complement of price control. A more equitable sharing of defence orders in the American chemical industry is expected to form the subject of an NPA order in the near future.

The American picture of control is clearly a moving picture rather than a still one. It is not even possible for the cynical chemist to remember War II controls and say, 'This is where we came in . . .'; for some of the new scarcities are different scarcities. It does not yet indicate the likely pattern of controls to come either in America or anywhere else. All that it reveals is that incurable shortages must carry controls of one kind or another and that the problem of securing an effective or tolerable balance between normal demands and defence demands is exceedingly complex. If the sulphur supply situation is not eased, our problems for many important chemical materials will be more intense.

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s. Single copies, 9d.; post paid, 1s.; SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham (Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited.

Notes & Comments

Zirconium Prospects

THE recent announcement of commercial-scale production of elementary zirconium in this country (*see* CHEMICAL AGE, 24 February, 1951, page 306) is only one indication that this somewhat obscure and modest element is beginning to attract notice. Large-scale production recently started in the United States and it is expected that the whole output of a plant—about half a ton a week—will be taken by the Atomic Energy Commission. The process being used there is reduction of the chloride with molten magnesium. As a major structural material for atomic furnaces zirconium not only resists great heat (its melting point is above 3400° F.) but it has a much lower tendency to absorb neutrons than other heat-resistant materials. It is reported, however, that an alloy containing high amounts of zirconium rather than pure zirconium is being used in building U.S. atomic furnaces. It is probable that almost all the metallic zirconium that can be produced in America for some considerable time will be taken up by the atomic energy stations. The variety of other industrial uses—particularly for acid resistance in chemical plant and for applications in electronic apparatus—may receive more investigation in this country. However, the price factor will limit its development as an anti-acid material in chemical plant construction; zirconium in a high state of purity cannot be cheaply produced. Some months ago the comparable U.S. prices of zirconium and titanium were 200 and 5 dollars per pound respectively. Another new use for zirconium which, at least on paper, would seem to have considerable significance was indicated in a recent American patent. Cast iron containing 0.5 per cent of zirconium and about 0.2 per cent of magnesium becomes ductile, i.e., can be rolled, forged, and tempered. An alloy of this nature could replace steel in many uses at present dominated by steel. However, the introduction of zirconium into alloys is not new in principle; several specialised steel and copper alloys have included small amounts of the element. In some contrast, a medicinal use of zirconium carbonate would seem to be entirely new. This is a development of accidental origin. During the recent war it was observed that workers in a department handling zirconium carbonate maintained a much fresher appearance and condition than other workers in the same factory. This was traced to the fact that the substance possessed exceptional anti-perspirant properties. Post-war investigations have since shown that ointments based upon zirconium carbonate have antidote-value for poison ivy irritation and show some promise as preventives for industrial dermatitis. Although first known in 1789 zirconium has never become a substantially used element either in free or combined forms. It has played small but important rôles in the manufacture of special lamp filaments and gas mantles. If an increased demand can lead to lower costs of production, metallic zirconium may become a widely used and well known element by the time it reaches its bicentenary.

'. . . Boswell to the Specialists'

SCIENCE writers to-day have a key task to perform in acting as liaison between the expert and the public. A democratic society requires an informed public and the correct interpretation of scientific achievement is the responsibility of the science writer. It is interesting to note, therefore, that there was recently launched in Paris a French Association of Science Writers—the fifth such national group of special writers in this field. The oldest is the National Association of Science Writers in the U.S.A.; the second is British; and then follow the Danish and Austrian. No science can flourish as an isolate, and while the writer frequently has to serve as eyes for the people, he may also, as Mr. Herbert B. Nichols, new head of the United Nations Educational Scientific and Cultural Organisation for the popularisation of science, pointed out, by his writings help to stimulate further thought and action, thus not only hastening

scientific progress, but also encouraging personal recognition for the pioneer scientists themselves. This is certainly true of the British science writers such as J. G. Crowther, Ritchie Calder, A. W. Haslett and others, who have pinpointed current research and its social implications so ably that new lines of development have been opened up. Indebtedness to science writers has, indeed, been frequently expressed, but perhaps seldom more adroitly than by Dr. Harlow Shapley, director of Harvard University, who said: 'I like these men of understanding who play Boswell to the specialist. The scientific interpreters frequently enhance our enjoyment in that they give us of themselves, as well as of the discoverers whose exploits they recount.' Unesco wishes to help the formation of associations of science writers throughout the world. When there are sufficient groups, the plan is to consider the establishment of an international federation of associations of science writers.

Private Libraries

IN the course of their careers chemists are apt to build up quite sizeable technical libraries. Even the steady removal of the temporary and transient publications will still leave behind a nucleus of lasting value. It is most undesirable that collections of specialised books of this kind should come under the ordinary, unspecialised hammer of an auction sale. A short time ago the household effects of an elderly chemist who had died were sold in this way. A parcel of books, some sixty in number and all of them technical, fetched less than four shillings. Although purchased casually, this one lot from the disintegrated library passed by chance into the hands of a chemist. In terms of hard cash the value of the books was at least ten pounds. One series of annual reports represented British chemical publications which are in urgent world demand owing to wartime losses, wartime restrictions upon circulation, and the inability to reprint old issues. The wastage lies not so much in the financial loss to the estate of the deceased chemist, but in the risk that books of very real value in their own right may pass uselessly from scientific circulation. It is possibly a gloomy thought, but any chemist who possesses his own accumulated library of books, especially those of the past twenty years, should ensure that in the event of his death they are not disposed of as 'junk.' For junk they are to non-scientific members of the public, and a few stacks of journals and abstracts may well seem a good 'buy' at a couple of shillings for firelighting paper! He might leave behind for his executors, widow, or children the advice to offer his books to one of the reputable dealers in technical books, in that way the still useful books are certain not to be wasted and his estate will receive their true market value. If, however, minor financial considerations are not important, he could leave his books to a scientific society or to one of the many institutional libraries with instructions for them to dispose of the books in any useful way they think fit. Or the library could be left to the one-time *alma mater* of university or college to be passed on to some deserving and suitable student. Any such plan is better than leaving behind for unguided disposal and possible total loss the books that must sadly outlast their original owner.

Repeal of Duty Proposed

THE Federation of British Industries' Memorandum to the Chancellor includes among its proposals a recommendation for the repeal of the 1s. 6d. duty on light hydrocarbon oils used in industrial processes.

The Industrial Light Oils Committee states:—

'It is not generally appreciated that the duty on light hydrocarbon oils, commonly known as the petrol duty, is also paid by a wide range of industries using light oils in manufacturing processes. These industries—which include rubber, paint, printing ink, wallpaper, linoleum, food manufacture, dyeing and cleaning, and others—have lodged an appeal with the Chancellor for the abatement of the tax on their essential raw materials. The grounds of the appeal are that the duty at the high rate of 1s. 6d. a gallon unnecessarily inflates production costs, and hampers efforts to compete in export markets.'

Dyestuffs Repay Science

Part One—Developments Benefit Medicine

THE separate sciences have all started off from small isolated groups of facts and items of knowledge, each group seeming to be distinct and unrelated to the others. Each science has grown and as it has pushed out its boundaries, it has met those of another, similarly growing science; certain facts, some observed phenomena become, it is evident, the joint property of two or perhaps more sciences. Not unusually, the ground that is common to two sciences, the borderland which they share, proves to be a fruitful land, one that is productive of increase in knowledge and improvement in technique.

Doubtless one of the main reasons for this fertility is that the common ground is cultivated by two types of minds; biochemistry which flourishes at the borders of biology and chemistry is served not only by men who have served their apprenticeship to biology and have become familiar with the logic of that science, but also by men who have served and become familiar with the discipline of chemistry. The intensive cultivation that such border sciences receives induces rapid growth so that they quickly spread not only on to new ground, but also on to that of the two sciences which gave them birth; these two sciences become in part unified and it is already clear that as science grows so it tends to become one. Already, strikingly close relationships are to be seen between fibres and muscles, between laboratory synthesised polymers and the materials of everyday life (wood, rubber, silicates, fibres) and even between matter and energy; it is impossible to make a comprehensive study of one of each of these pairs, without also studying the other. All science is one, but up to now we are familiar with only some of the more obvious landmarks.

Followed the Classical Path

The development of the science of dyeing has followed the classical path; it has been in no way exceptional. At first empiricism ruled; countless experiments yielded the odd success; mankind learnt that fibres could be dyed red with the madder plant (*Rubia tinctorium*) which grew on the Mediterranean hillsides, or Tyrian purple with a shellfish (*Rurex brandaris*) which some primitive woman must have dabbled with on the shore, or yellow and brown with various lichens. Until about one hundred years ago, dyeing was a fairly self-contained art, although it had always had some rather obvious potential links with chemistry, having been associated with it by the Egyptians in the infancy of chemistry, and much later, even having distracted the energies of some of the alchemists from their much more important search for the philosopher's stone.

Chemistry on the March

But, if the science of dyeing had made only little advance by 1850, that of chemistry was on the march. Hofmann, at the Prince Consort's invitation, had come from Germany to England in 1845 and had encouraged research on coal tar; his 'philosopher's stone' was synthetic quinine, but he never found it. Perkin, however, inspired by him, found Mauveine—the first synthetic dyestuff—in 1856. Once the bridge between synthetic chemistry and dyeing had been built, it carried heavy traffic; more and more chemists synthesised dyestuffs and within ten or twenty years there was a range of synthetic colours available which in most respects outclassed natural colours. Fuchsin came in 1859, the first acid dyestuffs in 1862, Bismarck Brown (the first azo dye) in 1864, Chrysoidine in 1876, and so on. Science produced new dyestuffs, one after the other, and for the past forty years at least there has been produced a range of dyestuffs that will dye almost any fibre almost any colour. So good is the range today that of the many new dyestuffs that are made every month, only one or two superlatively good can hope to live.

Science has transformed dyeing; instead of a few dyestuffs, often difficult to extract from natural sources, often expensive and available only in limited quality, there has been born from the marriage of chemistry and dyeing a host of brilliant colours which can be produced in practically unlimited quantities at relatively low costs. To-day the cost of dyestuffs for wool is reckoned in pence per pound of wool; it cost £87 to dye a pound of wool with Tyrian purple; only emperors could afford it.

The rapid expansion in dyeing science and the widening of its boundaries, has brought

dyeing into contact with other sciences, and as is always the case, with benefit to both. Medicine, biology, microscopy, photography, and chemistry itself have all benefited from the development of dyeing science. The dyestuffs industry owes almost everything to chemistry, but it has paid back more of the debt than is commonly realised. New dyestuffs, as they have been synthesised, have found many applications other than that of colouring fibres and related materials; their proclivities have extended far beyond this field, wide though it is. Their contributions to medicine alone have been varied and valuable, and these and some others will now be reviewed, at least so far as concerns their main features.

MEDICINE

Treatment of Burns

Probably, of all the medical applications of dyestuffs, the one which is most familiar to the layman is their use for the treatment of burns. Jellies of brilliant hue have become familiar in home and workshop, and have proved extremely effective in abolishing pain and ensuring quick healing after burns have been suffered. In the main, three dyestuffs, Gentian Violet, Acriflavine, and Brilliant Green have been used.

According to Wakeley and McIndoe[1], a jelly containing 1 per cent Gentian Violet and 0.02 per cent merthiolate was in general use during the 1939-45 war in the British Navy as a first-aid dressing for burns. More usually, Gentian Violet has been used in combination with the two other dyestuffs, Brilliant Green and Acriflavine. This 'triple dye mixture' has been used in different proportions; one which, according to Broster[2], was tested in a British naval hospital was made up as follows:—

2 per cent Gentian Violet.
1 per cent Brilliant Green.
0.1 per cent Acriflavine.

Some authorities have considered that the dye mixture treatment for burns results in less scarring and contraction of the skin than does the tannic acid treatment. The definite bactericidal action of the dyestuffs towards the streptococci which normally inhabit burned places within a few hours of the burn is undoubtedly beneficial. The dye mixture is active against both gram-positive and gram-negative bacteria.

Treatment of Sleeping Sickness

Sleeping sickness, or trypanosomiasis, is caused by the presence of parasitic protozoa known as *trypanosomes* in the blood-stream. Ehrlich, the German physiologist and Nobel Prizewinner, sought for some agent which could be injected into humans suffering from the disease which would kill the protozoa or at least restrict their multiplication without killing the host. One of the many substances that Ehrlich tried was Acriflavine, a dyestuff of the acridine group which was made for him by Benda[3]. Ehrlich found that it cured the disease in mice, but was useless in man. Whereas Acriflavine is 3,6-diamino-10-methylacridine chloride, Proflavine, also made by Benda and found also to have trypanocidal activity is the simpler, 3,6-diamino-acridine sulphate.

Later Ehrlich investigated the azo-group of dyestuffs and succeeded in finding individual members which could be used successfully against sleeping sickness. Trypan Red was one of these and Trypan Blue which was made by coupling bis-diazotised *o*-toluidine in alkali with two molecules of H-acid has actually been used as an agent against sleeping sickness.

But the early attempt to use Acriflavine was the most significant, despite the fact that the best trypanocides came later from a different group of dyestuffs, because it showed that one dyestuff at least had trypanocidal action and this was the first real introduction of dyestuffs into the field of medicine. Hitherto Acriflavine had been known mainly as a dyestuff which would dye cotton mordanted with tannin a bright yellow.

Bactericidal Activity

An unexpected development soon ensued from Ehrlich's work. Ehrlich had had an assistant by the name of Browning working with him on the trypanocidal activity of Acriflavine and Proflavine. Browning took these two dyes back to England with him and found that they had better bactericidal properties than any substance then known, and that furthermore they were relatively non-toxic. Browning and Gilmour[4] showed that they injured bacteria at so great a dilution that leucocytes, the blood's natural scavengers, were unharmed. Not only would the drugs attack protozoa—the simplest form of animal life (very often parasitic)—but they would also attack bacteria, which although commonly known as microbes, are really one of the lowest forms of plant-life. Furthermore, Acriflavine and other substances closely related to it chemically are more active in blood serum than

they are in water and, moreover, are well tolerated. That their toxicity is only low was first established by Browning, Gulbransen, Kennaway and Thornton[5]. These early indications of the high bactericidal activity of some of the acridine dyestuffs have been abundantly confirmed and they have received considerable application, although since 1942 non-staining acridines have been preferred to the staining Proflavine and Acriflavine. They have, however, all been derived from the acridine dyestuffs which were first known to us as basic dyestuffs with a high affinity for animal fibres (and tannined cotton).

Preferred for External Application

To-day, even though for the treatment of infection in the blood-stream no acridines are known which compare at all in efficacy with penicillin and the sulphonamides, nevertheless for external application in large wounds or on mucous membranes they are, according to Albert[6], often preferred.

It is an odd coincidence that 1912, the year in which Acriflavine was found to be of pathological interest, another, and quite different dyestuff, Gentian Violet, was reported by Churchman[7] to have considerable bactericidal activity. Its value as a bacteriostatic for the treatment of trench fever and Vincent's angina (an affection of the throat which has visual symptoms simulating those of the early stages of diphtheria) has been pointed out by Williams[8], who has recommended for use an aqueous solution containing 0.5 per cent of Gentian Violet and the same proportion of neutral Acriflavine. Mixtures of Acriflavine and Gentian Violet have been known as Acri-Violet.

According to Lesser[9], Gentian Violet has been used externally in from 0.1 to 2 per cent aqueous solution for skin antisepsis, while a mixture of Gentian Violet and Brilliant Green has been used to sterilise the skin prior to surgical operation. Gentian Violet has also been used in dentistry as a mouthwash after extractions.

Similar Bactericidal Properties

Each of the foregoing examples is of the bactericidal properties of Gentian Violet. Other dyestuffs which have similar bactericidal properties and have been used accordingly are Methyl Violet, Crystal Violet (these two are often used with Gentian Violet), Brilliant Green, and Malachite Green. Gentian Violet, chemically, is a mixture of penta- and hexa-methyl-*p*-rosaniline hydrochlorides.

The reason for the bacteriostatic and bactericidal activity of dyestuffs such as Gentian and Crystal Violets and Acriflavine is not known. This is not altogether surprising because the causes underlying the toxicity of various poisons towards organisms that are much larger and easier to examine than are bacteria are still not fully understood; for example, argument still centres round the mode of action of DDT on houseflies. It has been suggested that the balance of electro-magnetic radiation of different frequencies that falls on bacteria may be important for their vital mechanism; if this is so, it is easy to understand why dyestuffs, which selectively absorb certain bands of frequencies, should, by disturbing this balance, interfere with their life processes. It does seem very odd if this is not the case that the bactericidal action of the sulphanilamide drugs should be *increased* if they are made into dyestuffs by diazotisation and coupling with phenols. Ingle, Bringi, Phalnikar, and Bhide[10] made a number of such dyestuffs and tested them against *Staphylococcus aureus, Bacillus typhosus* and other bacteria and found that nearly all were more effective than the parent sulpha drug.

Fifty Comparisons Made

The anti-bacterial power of some fifty dyes was measured against *Staph. aureus* by Martin[11]. He found that Capri Blue, an oxazine dye, was the most active, followed by Ethyl Red, which is a quinoline derivative. An attempt was made to link anti-bacterial activity with dyestuff constitution, but without a great deal of success. The acridines, oxazines, pyronines, quinolines, and thiazines all had active members.

(To be continued)

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Chrome Industry Plans

Co-operate to Increase Domestic Supplies

THE American chrome industry, in co-operation with Government agencies, is planning to take steps to increase domestic supplies of chrome ores and concentrates. The U.S. Defence Minerals Administration, following a meeting in Washington, D.C., with producers' representatives, has announced that plans are now being developed to assure increased domestic production of chrome ore, and that a programme would be put into operation as soon as possible enlisting the co-operation of State mining departments in Oregon, California, and other chrome-producing States.

Chromite is a mineral containing variable amounts of chromium, iron, and aluminium. Three grades — metallurgical, refractory, and chemical—are recognised, corresponding to the three principal uses, but these are interchangeable to a limited extent.

Producers' representatives at the meeting listed the major factors which they believe are required to bring out substantial domestic production as: (1) A high price level, including a system of premiums and penalties designed to bring out a large proportion of high-grade ore; (2) an assurance of continuity of operations, with four years being suggested as the minimum contract period for direct shipping ore and five years for concentrates; and (3) provision for access roads to known chrome bearing areas that are now inaccessible.

It was pointed out that the nature of the deposits makes chrome mining in the United States a small operator's business and that machinery and equipment, except for mills for treating ore that requires concentration, are negligible factors. Conditions for expanding production were claimed to be more favourable now than they were in 1941 because to-day a large number of prospectors are ready to go out after ore, whereas in 1941 many of them had taken jobs in defence plants.

The advisability of some such scheme to increase domestic supplies is shown by the fact that American production of chromite has been negligible except during three periods—1828-80, 1916-18, and 1941-44.

During 1949, only four producers were active and domestic production was only 433 tons, compared with total U.S. consumption of 672,733 tons. The principal sources of supply were Turkey, Southern Rhodesia, New Caledonia, the Union of South Africa, and the Republic of the Philippines.

Stockpiling Failures Criticised

THE Government's prestige received a severe blow on 2 March when it was defeated by four votes on a private members' motion criticising them for not stockpiling vital commodities and for not making more use of private traders to ensure continuity of supplies.

This followed admissions by Mr. Harold Wilson, President of the Board of Trade, about the shortage of raw materials and the forecast of still further material controls for industry generally.

Unless Britain could get an increased allocation of sulphur from the U.S.A., it would mean cuts in industrial production and serious unemployment, especially in the textile industry. A slowing down of the rearmament effort would also be inevitable as would be an increase in the cost of living.

Mr. Wilson still hoped that increased supplies of sulphur from America might be possible, but if not the Government had ready for introduction a detailed plan for the allocation of sulphur and sulphuric acid.

If this plan was put into effect, supplies would be maintained to the key industries like steel production, oil refining, tinplate, vegetable oils, metal extraction and refining, and essential food and health services.

Urethane Oils Lecture

At the next meeting of the London Section of the Oil and Colour Chemists' Association, a paper on 'Urethane Oils' will be given by R. B. Waters, M.Sc., Ph.D., A.R.I.C., and E. B. Robinson, M.Sc., A.R.I.C. The meeting will be held in the Lecture Room of the Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1, at 7 p.m. on Wednesday, 14 March, and all those interested are invited to attend. Light refreshments will be available after the meeting.

Sulphur Recovery in Germany

Methods Used to Combat Shortage

IN view of the present shortage of sulphur, caused largely by the reduction of U.S. exports to Europe, there should be renewed interest in the various methods adopted in Germany to combat a similar shortage lasting over a long period.

In this connection the captured German documents and microfilmed reports, as well as the well-known reports by allied investigators, should assume a new and special significance. It should be emphasised that all this material is held by the Technical Information and Documents Unit for the benefit of British industry.* In many cases the technical information includes plant lay-out, detailed drawings, operating instructions, etc. Other documents contain technical data obtained in the development or pilot-plant stage, and yet others describe laboratory tests in connection with new projects.

Several inquiries have been received recently on the sulphur problem, and it was felt that an effort should be made to bring this material to the notice of industrial firms and other organisations likely to be affected by the present shortage. The opportunity has been taken to include in the report some references to information, obtained recently, on natural sulphur supplies oustide the United States.

Danger Seen Before 1939

The German government had recognised, long before the 1939-1945 war, the necessity of economising in sulphur in view of the fact that they were dependent mainly on supplies from overseas. As a result they set up an organisation controlling production, imports and distribution of sulphur. This organisation, known as Schwefel G.m.b.H., Berlin, was responsible for collecting data from all concerned relating to sulphur and its recovery. It instructed individual firms regarding the best methods to be adopted in preserving sulphur supplies, and it was the negotiating body with foreign firms on sulphur imports. From documents emanating from this organisation we know that, for example, in the year 1943-1944 a total of approximately 90,000 tons of sulphur was recovered from sulphur-containing wastes, including industrial gases, in the various industries.

In addition, economies were made through the setting up of plants for the manufacture of sulphuric acid from anhydrite. Through this project alone, 20,000 tons of sulphur was saved in 1943.

Regarding the recovery of sulphur from coal, it may be noted here that the Germans had recovered 70 per cent of the available sulphur in coal in the Ruhr by the end of 1944.

Probably the most important process in Germany for the recovery of sulphur was the 'Alkazid' process, coupled with the catalytic oxidation of hydrogen sulphide in Claus ovens. Alhough there is considerable information on other processes, the most detailed information available relates to these processes.

Various Methods Adopted

It will be convenient to divide the various methods adopted into (a) dry recovery processes, (b) wet recovery processes, and (c) processes in which an organic liquid is used as the scrubbing medium.

(a) Dry Recovery Processes: The use of iron oxide is probably the oldest known process of sulphur recovery. The iron oxide reacts with hydrogen sulphide and, therefore, the presence of another substance increasing the alkalinity of the medium is of advantage. Thus traces of ammonia have been used to increase the rate of absorption of hydrogen sulphide (FDX 487, frames 4500-3; FDX 503, frames 6574-91; FDX 236; frames 858-9 and FD 4845/47).

Where the concentration of hydrogen sulphide in the gas is low (under 5 g/m³), *e.g.*, in producer gas or water gas, active carbon ('Carbonorit') is often used in place of iron oxide. The absorption over 'Carbonorit' was followed by scrubbing with ammonium sulphide or CS_2 (FD 1345/49 and TOM Reel 207, III, Part 1, frames 85-7).

The principles of dry recovery processes, especially as applied to coke oven gases, are described in *Gass and Wasserfach*, 1938, *81*, p. 822-8.

(b) Wet Recovery Processes: In these processes the oxygen carrier is present either in solution or in colloidal suspension. The 'Thylox' process in America uses a salt of thio-arsenic acid. A description of a

plant making 7,500 kilogrammes of sulphur per day by this process is given in a microfilm (FDX 642, frames 8234-40; also *Chem. Fabrik.*, 1939, *12*, p. 15).

In the potash process the scrubbing medium is potassium hydroxide, which is subsequently warmed to release hydrogen sulphide (TOM Reel 207, IV, Part 2 & 4, frames 92-3, 99-100).

A solution of complex cyanides is employed in the Staatsminjen-Otto process. A short description and references to published literature on this process are given in FDX 709, frame 38355 (cf. also FDX 236, frames 858-6).

The 'Katasulf' Process

The Katasulf' process developed by the I. G. Farben is based upon the oxidation of hydrogen sulphide gas to SO_2, which is absorbed by ammonia. It is specially suited to coke-oven gases where ammonia is available on the site. This process is described in a publication (not held by T.I.D.U.) *Chem. Fabrik.*, 1938, *11*, p. 10 (cf. also FDX 236, frames 858-66 and FDX 89, frames 485-6).

(c) Processes using an Organic Scrubbing Agent: The two most important processes in this field are the 'Girbotol' and the 'Alkazid'. Both are essentially 'enriching' processes, in that the hydrogen sulphide-containing gases are led through organic absorbing agents, and subsequently a gas rich in hydrogen sulphide is released. Thus they provide the first stage in sulphur recovery proper. The hydrogen sulphide is then oxidised, either to sulphur in Claus ovens, or directly to sulphuric acid in the 'Lurgi' process (FD 5558/47 and FD 2250/48).

The 'Girbotol' process uses mono-, di-, or tri-ethanolamine, or diamino-propanol (FDX 647, frames 2962-3, and FDX 89, frames 479-89). The 'Alkazid' process was claimed to be more efficient than the 'Girbotol' process. The chemical compound used in aqueous solution consisted of the alkali salt of amino-propionic acid. The Germans subsequently developed quite a number of compounds for this purpose, some of chemical constitution related to this original compound, others entirely unrelated. Information held in the unit includes instructions concerning the methods of preparation of chemicals, the corrosive nature of the 'Alkazid' lyes, plant drawings, flow sheets, etc.

The largest plant for this purpose was installed at Wolfen, which is now in the Russian zone. The basis of the process was the reduction of calcium sulphate with coke; the by-product is a Portland cement clinker. Experiments have also been carried out in connection with the production of *sulphur* by the reduction of calcium sulphate (anhydrite), without, at the same time, acquiring valuable by-products, such as cement. These experiments did not, however, result in the erection of large-scale plants, as the method was not considered economic (FD 5034/47).

The main natural sulphur resources outside the United States are those in Sicily, where over 380,000 tons were produced in 1938, and although there was a slump in the production during and immediately after the war, it is expected that production of raw fused sulphur in Italy will reach a level of about 200,000 tons in 1951. Two reports containing up-to-date information on the Italian sulphur industry have been received recently from the Commercial Department of the British Embassy in Rome, and are held at T.I.D.U. under the references B/TP 200/1944 and B/TP 200/1945.

To Analyse Rain Water

EXPERIMENTS on the chemical composition of rain water are to be carried out in India for the first time by the Meteorological Department of the Government of India.

Rain water will be collected during the monsoon in neutral glass bottles at meteorological laboratories situated in various parts of the country and will be analysed for chlorine, free ammonia, albuminoid, sulphate, nitrogen and other chemical contents.

Apart from scientific interest, the results obtained from this analysis are expected to be useful for agricultural purposes. According to meteorological experts, a knowledge of the chemical composition of rain water will help to find out how far the fertility of the soil is increased by it, as the oxides it contains react with the soluble salts of the soil and form valuable fertilisers.

These experts are of opinion that rain water is far from being pure and is not fit for drinking purposes, as it does not contain many of the useful mineral salts which ordinary water contains. It is considered that rain water, in falling, dissolves oxygen, carbon dioxide, nitrogen, ammonia and ammonia nitrate and also carries down dust floating in the atmosphere.

Soaring Chemical Imports

January Total Over £4,000,000

RISING costs were no doubt partly responsible for the increased value of chemical imports in January, as for example in the case of sulphur where the actual tonnage was less but the value was £62,000 greater. Chemicals, drugs, dyes and colours imported in January amounted to £4,719,514 compared with values for the group of £2,609,934 in the same month of last year, and £2,175,503 in 1949.

Notable increases revealed in the *Trade and Navigation Accounts of the United Kingdom* included: calcium superphosphate £466,076 (£119,065); glycol and glycol etheresters £43,812 (£18,110); potassium compounds £674,781 (£512,023).

Among the non-ferrous metals exceptional increases were: mercury £34,585 (£6,487), zinc £1,584,943 (£556,954), and silicon £46,691 (£20,043).

	January, 1951	January, 1950
	Cwt.	Cwt.
Boric acid	12,830	10,550
Value of all other sorts of acid	£78,691	£80,973
	Cwt.	Cwt.
Borax	38,901	28,440
Cobalt oxides	714	537
	Tons	Tons
Calcium superphosphate	46,257	11,045
Glycol ethers and glycol ether-esters	Lb. 507,376	Lb. 182,038
Iodine	88,118	16,000
	Cwt.	Cwt.
Phenol	1,874	—
Potassium chloride	799,119	573,416
Potassium sulphate	50,362	27,760
All other potassium compounds	17,226	6,444
Value of all potassium compounds	£674,781	£512,023
	Cwt.	Cwt.
Sodium nitrate	171,267	—
All other sodium compounds	31,841	4,323
Value of chemical manufactures, etc., all other sorts	£1,163,343	£587,410
	Cwt.	Cwt.
Synthetic organic dyestuffs	2,276	1,219
Extracts for dyeing	3,002	2,105
Extracts for tanning (solid or liquid)	119,487	107,010
All other dyestuffs	1,339	196
Earth colours (except black)	62,151	6,353
Carbon blacks (from natural gas)	85,628	98,039
Value of carbon blacks	£374,418	£400,927
Other blacks, including vegetable, lamp, acetylene and bone	10,097	12,188
Value of paints and extenders	£536,245	£533,236
Total value of chemicals, drugs, dyes and colours group	£4,719,514	£2,609,934
	Lb.	Lb.
Synthetic oils	8,035	3,259
	Cwt.	Cwt.
Mineral jelly	12,196	5,633
	Cwt.	Cwt.
Turpentine	35,447	15,446
Wax, petroleum: paraffin wax	61,833	39,421
Value of oils, fats and resins	£14,286,583	£9,596,250
	Tons	Tons
Aluminium oxide (crude unground)	1,780	1,426
Silicon carbide	814	464
Asbestos, raw and fibre	6,496	6,954
Asphalt and bitumen (natural)	4,820	4,413
Diatomaceous earth	1,089	1,250
Graphite (plumbago), natural and artificial	945	611
Magnesite	1,812	1,536
Sulphur	29,223	32,285
Value of sulphur	£369,245	£307,197
Value of non-metalliferous mining and quarry products	£1,534,400	£1,212,678
	Cwt.	Cwt.
Gas and chemical machinery	569	2,721
Value	£15,770	£95,112
	Cwt.	Cwt.
Plastic materials	23,897	16,886
Value	£518,547	£403,129
	Tons	Tons
Barrels and drums, empty (iron or steel)	1,137	56
Value	£86,891	£3,929
	Lb.	Lb.
Mercury	83,612	28,864
Value	£34,585	£6,487
	Tons	Tons
Silicon metal	397	154
Value	£46,691	£20,043
	Tons	Tons
Zinc	11,235	7,199
Value	£1,584,943	£556,954

H_2SO_4 Plant for Scotland

PLANS for a sulphuric acid manufacturing plant to be erected at Sandilands Chemical Works, Aberdeen, at a cost of over £400,000 have been approved by the Aberdeen Corporation Plans and Town Planning Committee.

The installation will be a combination of a flash roasting pyrites furnace, claimed to be the largest in the world, and a Petersen tower plant, the first to be erected in this country.

Correnie granite is being used for the first time to pack the brick walls of the six towers of the installation. Tests have shown the granite to be satisfactorily resistant to acid.

The new plant which is expected to be in full production in about two years, will produce 37,000 tons of 100 per cent sulphuric acid annually. It will be able to make sufficient acid for all the superphosphate required by the agricultural industry in the north and north-east of Scotland.

Anglo-Brazilian Trade

Permitted Chemical Imports

OWING to the scarcity of sterling and Swedish crowns it is announced by the Export-Import department of the Bank of Brazil that licences for imports payable in those currencies, as well as in U.S. dollars and Swiss francs will be restricted during the first half of this year to certain specified products.

These include: acetyl cellulose and nitrocellulose; natural borax; solids, semi-solids and liquids derived from coal; sulphur in all forms; amorphous phosphorous; unspecified colours or colouring matter; bakelite and similars based on urea; synthetic rubber and resins; aniline dyes; unspecified chemical products for rubber, tanning and textile factories; acetic esters; solvents and thinners for paint; plastic solvents; chemically prepared paper for insulating and adhesive tapes; acids, citric, formic, oxalic, and unspecified organic acids; alcohols; sugars and edulcoratives, including saccharine and lactose; synthetic camphor; halogenated derivatives of ethers; benzol, toluol and xylol; unspecified substances for manufacturing aniline dyes; phenol; sodium and potassium ferricyanides; tartar emetic.

Organic chemical products for analysis or scientific use; bicarbonate of soda; potash; carbonates of calcium, potassium and magnesium; chlorides of barium and tin; nitrates of potassium, calcium and silver; sulphates of aluminium, barium, copper, zinc, iron, nicotine and copper, and unspecified sulphates; sulphides and hydrosulphides; haloid salts for analysis or scientific use; potassium and sodium chromate; unspecified mineral salts; boric and phosphoric acids; unspecified inorganic acids; organic anhydrites; potassium and sodium chromates and unspecified chromates; potassium and sodium hydrates; oxides of cobalt, chrome, synthetic iron, magnesium, titanium, zinc and unspecified oxides; peroxide of lead; acids, alkalis and anhydrides for analysis or scientific use; ammoniac or ammonia, liquid or in aqueous solution, compressed or liquefied; hydrosulphites stabilised by formol or acetone; unspecified chemical products for industrial purposes; insecticides.

It should be noted that insecticides, fungicides, fertilisers, of makes registered at the Ministry of Agriculture, and chemical products required for the industrialisation of animal and vegetable raw materials, may be imported without prior licence. Quantities are limited only by the amount of exchange available.

A state-owned factory to produce sulphonals, the second of its kind in Brazil, has been inaugurated at Belo Horizonte by the Minas Geraes Government. It forms part of the programme to combat leprosy.

Sulphur from Pyritic Ores

THE problem of exploiting pyritic ores in Canada as a source of sulphur supply has received fresh urgency from the increasing industrial demand and the dwindling reserves of the Texas sulphur mines.

A reserve of a million tons of sulphur, in addition to zinc, iron, copper and precious metals, are estimated to be available in the proved ore-bodies of the Noranda and Macdonald mines.

Launching of a large new mining industry in Canada to produce elemental sulphur and sulphur products and iron from pyritic ore, was only a matter of time, Mr. Carlton Street, president of Macdonald Mines, stated recently. Such a development naturally depended on perfecting metallurgical processes, and careful study on a large-scale of methods, markets and the location of plants.

Uranium & Thorium

THE Government of India have announced that a project for setting up a factory for the production of uranium and thorium compounds in India is nearing completion. The raw materials will be the uranium-bearing residues from the monazite factory at Alwaye in South India. The factory is contemplated to be self-supporting by meeting its operation costs through the sale of thorium compounds.

The Indian Atomic Energy Commission have submitted a report to the Government that the manufacture of beryllium and its alloys is under consideration and that it proposes to set up a pilot plant for the purpose at the National Metallurgical Laboratory at Jamshedpur.

The discovery of valuable deposits of strategic materials in India such as beryl, monazite and uranium minerals is detailed in the report which also says that methods of commercial utilisation are being developed.

Insecticide Formulation

The Problem of Application

A BRANCH of artificial insecticide manufacture which does not perhaps get quite so much limelight as its elder brothers, discovery and synthesis, is formulation. New insecticides are being looked for and discovered every day, each one with greater and more varied effects than its predecessor. What perhaps is not realised is the equally important research that must go on between the discovery of a new insecticide and its delivery in usable form to the people who use it.

In this connection the activities of Plant Protection, Ltd. (one of the biggest firms dealing in formulation), at their factory at Yalding in Kent, are a good example.

Before the concentrated chemicals produced by insecticide manufacturers are ready for distribution to farmers, they must be diluted to suitable proportions and brought into the right condition for use in the fields. Formulation involves the use of fillers, wetting agents and emulsifiers in order that the finished products may be dispatched in the forms most suitable for specific applications. A powder must flow freely, a seed dressing must adhere to the seed and not be too dusty, fungicide or insecticide dusts must adhere to the leaves of plants. The weight of the dust must also be taken into consideration and will depend on whether the crop is tall or short.

Degrees of Fineness

For some applications a dispersible powder may be required and then the product must be ground to micron fineness. On the other hand, a much less finely-ground powder might be suitable for application by spraying machines equipped with powerful agitators. The addition of a suitable wetting agent may produce a formulation which will remain in suspension long enough for the farmer's purpose. In some circumstances a dispersible liquid formulation may have definite advantages over wettable powder and emulsion types of products. Many different types of chemicals are dispatched to Yalding in concentrated form, each of which calls for a considerable number of formulations to cover every need. Between 130 and 150 formulations are marketed, many of the finished products being sold in a variety of packings to suit the requirements of different users.

Handling of materials and finished products is facilitated by a railway line which serves the entire factory. Incoming trucks are diverted from the main line and brought to the unloading bays by the company's own diesel locomotive. Before many of the active chemicals in their raw state can be put into the mixers for incorporating with the inert diluents, they have to be ground. In the case of chemicals such as BHC this presents a difficulty, for its waxy nature makes the material difficult to grind in the normal way. This problem has been overcome by grinding these chemicals in a refrigerated plant, often with a small amount of filler added. In this manner they can be reduced to a fine powder. The filler, coating the minute particles of the BHC, stops the powder from aggregating when the temperature returns to normal.

Mixing Process

From this operation the chemicals go on to the next stage in the mixing shed. One mixing shed alone is 180 ft. square and handles 600 tons a week of materials and finished products. The mixers range in capacity from 1 to 5 tons, and samples from each batch are sent to the laboratory for testing. A feature of the mixing plant is that any liquids can be imparted to any powders. The correct weight of liquid is delivered to a rectangular tank, elevated by a small but powerful pump, and delivered through a pipeline to the desired mixer. A nozzle in the pipe-line reduces the liquid to a fine spray, for injection into the machine. Up to 20 per cent of the liquid net weight is injected into some inerts, while in some cases the figure may be as low as 0.75 per cent.

The utmost care is taken during the handling and mixing of all toxic chemicals. Nicotine and parathion call for special precautions, because the poison may be absorbed through the skin as well as through the mouth. Workers handling nicotine are, therefore, protected by overalls, gas masks, rubber gloves, aprons and boots. The

precautions include washing and the rinsing of outer clothing when the workers leave the shed. Workers handling parathion are examined by the works medical officer once a month. Air tests are taken at regular intervals by the laboratory, the maximum amount of parathion allowed in the air during the manufacture of either powders or liquids being one milligram per cubic metre of air.

Emulsions are prepared in a special department of the factory, two alternative methods of manufacture being employed. In one method homogenisation is carried out in plant in which the mixture is forced between a fixed and a revolving plate, the gap between the plates being adjustable from one to 20 thousands of an inch. Alternatively a direct pressure process may be employed.

Packaging Problem

In formulating the numerous preparations special attention has to be devoted to the problems involved in storage and transport. The products must remain stable in the packings without eating their way through the containers. Powders must obviously be in fine condition when applied or they will not dust. Consignments destined for tropical countries must, therefore, be given adequate protection from moisture during storage and transit. All materials used for packaging are tested by storing samples of the products in the proposed containers at temperatures ranging from $-15°$ to $+50°C$.

The packing problem has lately been aggravated by the critical shortage of steel drums. The company has been forced to examine various possible materials that would not normally be employed. In place of 15 kgm. steel containers, for instance, consideration has had to be given to hessian bitumastic paper lined, ply paper with plastic liners, various types of wooden kegs and boxes with plastic liners, and even fibre board packages with plastic liners.

The company is particularly interested in the possibilities of plastic liners, which are giving satisfactory service in nearly all respects. One disadvantage is that when a packet has been opened and partially used, the farmer cannot be expected to effect an air-tight seal. Fair protection during subsequent storage can be obtained, however, without heat sealing, if the neck of the liner is suitably folded and secured.

Among the packaging problems still under investigation is the development of an entirely fool-proof container for parathion. At present liquid parathion products are packed in small cans with patent seals, which are entirely leak-proof during transit, but work is still being carried on in an attempt to make them fool-proof in use. Thus parathion provides a container problem of a very special nature. In the United States it has been argued that, since parathion is fairly readily absorbed through the skin, dispersable powders are preferable to liquids, because there would be more danger in handling liquid concentrates than in handling concentrated dispersable powders. British investigators are of opinion, however, that by formulating the product as a liquid they minimise the danger of absorption into the lungs at the mixing point of the spray routine. If any liquid is spilt on to the hands or on to any other part of the body, there is a good chance that it can be washed off before serious absorption into the system has taken place.

Primary Precautions Taken

The opinion has been expressed that parathion will be regarded with less apprehension when it has become more familiar to farmers and other users. Petrol, gas and electricity are all inherently dangerous, but they cause very few accidents because people know how to handle them and what precautions to take. Plant Protection, Ltd., have shown that parathion can be safely handled during manufacture in concentrations far greater than the dilute preparations supplied to users. The primary precautions are taken by the manufacturers in deciding what types of formulation should be offered to the farmer.

Considerable problems are presented at Yalding by the storage of materials, packages and bulk stocks.

The problem has, however, been overcome by building a vast concrete storage tank underground, divided into sections, with a storage capacity approaching 250,000 gallons.

Substantial extensions have recently been made to the laboratories at Yalding, and it is hoped to include a sample store where samples will be kept for about 2½ years for test and reference purposes. Between 8,000 and 10,000 samples are at the moment received for analysis every year.

Radiochemistry on the Micro Scale

Techniques in Micro-Analysis

AT a meeting of the Microchemistry Group of the Society of Public Analysts and Other Analytical Chemists held at the Sir John Cass College on 26 January, 1951, three papers on 'Radiochemical Techniques in Microchemistry' were presented by members of the staff of the Atomic Energy Research Establishment, Harwell. A summary of each of these three papers is given below:—

'The Use of the Quartz Ultramicrobalance in Radiochemistry,' by J. K. Dawson, Ph.D.

The construction and operation of the quartz ultramicrobalances developed in the Chalk River Laboratories and in use at Harwell, were described by Dr. Dawson in some detail. The sensitivity of these is rather better than 10^{-5} g. and the variation between 0—300 mg. load on each arm is about 0.5 per cent; this is expected to be even better on future models. Installation on a vibration proof pillar is desirable for the most accurate operation of the balance, but a temperature-controlled room is not necessary.

Reproducible weighings can be performed on small platinum trays or boats within the limit of about $\pm$ 0.03 μg. The balance must be surrounded by a closed box and manipulation inside the box is by means of rubber gloves sealed through the walls, the latter being made of perspex for ease of viewing. The atmosphere inside the box is kept close to zero humidity by silica gel and the effects arising from static electricity are eliminated by one-millicurie sources of thallium 204 under each balance arm. Spare beams are fitted on special jigs and in the event of a balance beam being broken it may be replaced very easily and quickly. The balances are used for the determination of the purity of plutonium solutions and for gravimetric analysis of its compounds. Solid gas reactions may be followed on samples of starting material less than one milligram in weight and the use of the beams provides a method of measuring magnetic susceptibility on the micro-scale.

'The Micromanipulation of Radioactive Gases,' by W. J. Arrol, Ph.D.

The amounts of radioactive isotopes which are 'carrier free' and of short life are extremely small, and if they are in a gaseous form the problem arises of their safe handling. The emanations of the natural radioactive series have long been manipulated regularly in quite large activities and at the other end of the scale it is possible, using carefully selected physical methods, to manipulate quantitatively amounts of radon of as little as about 1,000 atoms.

It is now frequently necessary to carry out manipulations, on the scale of a few micrograms, of radioactive material which must be chemically purified. Most gases can be purified quite easily and it is often an advantage to convert a radio-isotope to a vapour or gas, in order to purify it from both chemical and radioactive contaminants. Examples include iodine 131 which is prepared from tellurium by the reactions: $Te \xrightarrow{130(+n,\gamma)} Te \xrightarrow{131(-\beta)} I^{131}$ where the irradiated tellurium is dissolved in chromic-sulphuric acid mixture, when the I^{131} goes into solution as iodate ion. This is converted into elementary iodine by oxalic acid and can then be steam-distilled to free it from other materials present. It is converted to iodide by trapping in alkaline bisulphite solution and is then further purified by reconversion to iodine and distilling a second time into bisulphite solution.

Other radioactive elements in which gas phase manipulation and purification are used are tritium, carbon 14 and ruthenium. In both the preparation and estimation of radioactive materials, the gas phase is becoming increasingly important.

'The Determination of Trace Quantities of Elements by Radioactivation Analysis,' by A. A. Smales, B.Sc., A.R.I.C.

The principle of radioactivation analysis is that any element or, in fact, any isotope which can be made radioactive can also, in theory, be determined by measuring this induced radioactivty.

The potential scope of the method is therefore very wide, for since many types of nuclear reaction are possible, radio-isotopes of almost all elements can be artificially produced. For example, with slow neutrons in a nuclear reactor (pile), over 80

elements give rise to active isotopes, many of which are convenient from an analytical point of view.

The potential sensitivity depends mainly upon the neutron flux available and the activation cross-section of the particular element or isotope concerned. If a figure of 1000 disintegrations per minute (i.e., at least double the normal β-particle background of the usual end-window Geiger tube assembly) is accepted as a limiting sensitivity for determination, and a flux of 10^{12} neutrons/cm^2/sec. is assumed to be available (e.g. in the Harwell pile), then it should be possible to determine several elements in quantities from 10^{-12} g. (e.g. Eu, Dy) through 10^{-11} g. (e.g. Ir, Rh,In,Tm, Lu, Sc, Au,Ag, Ho. Co, etc.) and upwards.

In usual practice, the samples are irradiated simultaneously with standards, preferably, but not necessarily, of the same general composition but containing a known weight of the element concerned. The required element is chemically separated after addition of an inactive carrier element (although in some favourable cases it might be possible to omit this step), and then the activity of the sample and the standard are measured under similar conditions after determining the chemical yields, which need not be 100 per cent, by conventional means. After checking the radiochemical purity by decay and absorption measurements, it is possible to calculate the weight of element originally irradiated.

Examples of determinations carried out in the Analytical Chemistry Group at Harwell are: rubidium in potassium salts; sodium in aluminium compounds; hafnium oxide in zirconium oxide; iridium in rhodium—all without chemical separations. Determinations of arsenic in 'arsenic free' zinc and in germanium oxide involve chemical separations. In the latter case it has recently been found possible to determine down to 1 part of arsenic in 10^8 parts of germanium oxide while examples were quoted of the determination of arsenic down to 10^{-9} g. in different tissues from a single healthy mouse.

Apart from the remarkable potential sensitivity of this method, there is a further advantage in that since inactive carrier material may be added after irradiation, such difficulties in handling sub-microgram quantities as losses by adsorption, blanks on reagents, etc., are largely avoided. A good example of the complete avoidance of contamination has been the determination of arsenic in broad beans.

It was pointed out at the meeting that facilities for irradiation in the Harwell pile are generally available.

Exemptions from Key Duty

THE Treasury have made an Order under Section 10 (5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty for the period beginning 2 March and ending 19 August:—R. acetone; acetone, fermentation; acetone, synthetic; butacaine sulphate (an aminobenzoic ester); di-methylcyclohexyl phthalate (an alkylcyclohexyl ester); ethyl α-hydroxy-α-methylbutyrate (an ethyl ester); guanidine nitrate (a guanidine salt); hydroquinone; 4-hydroxy-2-aminopyrimidine; and lithium sulphate, of which the lithium is in the form of a stable isotope either of atomic weight 6 or of atomic weight 7, of a value not less than £1 per gramme.

The Treasury have also made the Additional Import Duties (No. 1) Order, 1951, exempting acetone from additional duty under the Import Duties Act, 1932, for a period ending 19 August, 1951.

The effect of these Orders on acetone is to make all types chargeable at the 10 per cent general *ad valorem* duty only from 2 March, 1951, to 19 August, 1951.

Nuclear Energy for Power

INCREASING investigation into the possibility of employing nuclear energy as a source of power is being made at the Atomic Energy Research Establishment, Harwell.

This was revealed by Sir John Cockroft, director, in a paper delivered last week to the Royal Society in London.

Four main objects of the work at Harwell were to carry out basic research work; to provide technological information; to produce radioactive and stable isotopes; and to investigate the potentialities of nuclear energy as a source of power.

Up to now the greater part of the efforts had been devoted to the first three, but this was now changing more in favour of the nuclear power programme. There were now 60 different groups in the establishment, resulting in considerable competition for the spare neutrons of the pile.

Five Years of Co-operative Research

Work of the British Iron & Steel Research Association

EXAMPLES of a large number of research projects completed or in progress, and advances made, together with some possible future developments are surveyed in a brief account now available from the British Iron and Steel Research Association.

A scheme for co-operative research was agreed upon by the British Iron and Steel Federation and the Iron and Steel Institute, and it was agreed that this should be conducted under the auspices of the British Iron and Steel Research Association, which was established in 1945. Help was given by the Department of Scientific and Industrial Research, both financially and with advice and from its experience.

The Research Association has thus been functioning for five years, during which it has had to grow from a relatively small organisation to its present size. In the early stages much effort was inevitably absorbed in organisation, staffing, and so on, but from the first research work was actively pursued and the rate of expansion was such that the association may well claim now to be fully grown.

The industry's first Development Plan, which was formulated at the end of 1945, has progressed so far that the preparation of a second plan is now beginning. The expectation is that this second Plan of Development will be devoted even more intensively to increasing efficiency rather than to increasing the total output of the industry.

The Association's Aims

The range of the association's activities and its aims are those of the Iron and Steel Industry of which it is a part. Its interests begin with the ore in the ground and continue with the making of iron and steel and its fabrication as far as some of the uses of the finished products, including the design and operation of plant and equipment. Its aims are to increase production, improve efficiency and reduce costs by research, fundamental as well as applied, by organising co-operation with and between firms, and by spreading knowledge of new developments throughout the industry.

An organisation has been developed consisting of six divisions corresponding to the main processes in the industry. The divisions are ironmaking, steelmaking, mechanical working, steel castings, plant engineering and metallurgy. In addition there are physics and chemistry departments and an operational research section which serve all the divisions. The first two provide a fundamental background and specialised services such as the development of instruments.

'User Liaison Section'

There is also, of course, an administrative department which provides accounting, secretarial, information and other services for the whole organisation. A small 'User Liaison' section deals with technical inquiries from users of iron and steel either directly or by referring them to the appropriate iron and steel supplier.

Policy has been to develop laboratories in different centres of the industry, most of them specialising in a particular part of the field. Thus, research on metal surfaces and coatings on iron and steel is carried out at Swansea in an area largely concerned with tin plating and galvanising. A laboratory for problems concerned with ironmaking and the treatment of ores has recently been set up in the N.E. Coast area. At a centre in Sheffield, which is now being expanded, there is a group of laboratories, concerned with steelmaking, steel founding, and the working of steel. The association's corrosion laboratory is at present in Birmingham, though it will eventually move to Sheffield.

Each of these research stations carries out pilot plant work in neighbouring works and further afield. Other teams of BISRA staff have worked for a number of years in firms in many areas, and this field work is increasing.

The more fundamental research is carried out in a number of universities and in the BISRA laboratories for physics and chemistry. Laboratory facilities at Imperial College, London, are used for fundamental work on iron-making processes and on physical chemistry.

Studies have supported practical work

on ore problems. The mineralogical compositions of low grade ores have been investigated by differential thermal analysis. The mechanism of sintering has been studied and commercial and laboratory products compared.

The more that is known about the blast furnace process the better and more economically it can be operated. A knowledge of the actual and relative velocities of the gas, for example, is important in assessing the advantages of the American development of high top pressure, the effect of which is to make the gas travel more slowly, giving more time for the reactions between the reducing gases and the burden in the stack. This gives quicker reduction of the iron and increases production.

Radioactive Radon Gas Used

Radioactive radon gas has been used for measuring gas velocity through the furnace. Radon is projected into one tuyere by a small explosive charge, and sampling starts simultaneously at the furnace top. Successive samples of the gas are tested for radioactivity and the transit times of the gas are deduced and the difference in speeds at the centre and near the walls has been estimated. In the various furnaces studied the gas takes about seven times longer to pass through than had been thought.

A simple and more efficient open hearth design, known as the 'single uptake' furnace has been developed. Small scale trials were begun at the experimental furnace at Shelton, and most promising results were obtained there and later by fundamental work carried out on models by the association and by the United Steel Companies, Ltd. Now there are 18 single uptake furnaces in operation in at least 11 steel works and more are being installed. Experience has shown that this design gives rapid and increased production, better control of melting, and lower fuel and refractory consumption.

Instrumentation of open hearth furnaces is another development in which BISRA has played a large part. Not only have the needs of the operators been met by the design of special instruments, but a survey of the more general needs of the industry for instruments and an assessment of the possibilities and limitations of instrumentation has been made. A handbook of open hearth instrument practice has been prepared and will be published during 1951.

The possibility of continuous casting, or the fabrication of semi-finished steel directly from the liquid metal has attracted the steel industry for many years. A small scale apparatus, casting round bars up to 3 in. in diameter, has been built and operated successfully. In preparation for the installation of continuous casting machines by some works, measurements are being made on such physical processes as heat transfer and mould friction.

The effects of casting temperature, casting speed and mould contour on this process are also being studied, and a detailed theoretical study of solidification rates under various surface conditions has been completed. It seems likely that the process will be practicable for alloy steel production in the first instance.

Many thousands of tons of sulphuric acid are used by the steel industry each year for 'pickling' steel. This acid is converted during pickling into a solution of ferrous sulphate in dilute sulphuric acid. The disposal of this 'spent liquor' is not only difficult but extremely wasteful, for though the ferrous sulphate can be removed by crystallisation and the mother liquors used again in the pickling tanks, uses can be found for only a small proportion of the large amounts of ferrous sulphate remaining.

Sulphuric Acid Recovery

A method of regenerating fresh sulphuric acid from the ferrous sulphate has been developed by the association and a pilot scale plant is now being built at a steel works in South Wales. An economic appraisal of the process on a large scale indicates that it should result in substantial savings to the industry, besides conserving sulphur, which this country imports in raw form from hard currency countries.

The widest range of experience and knowledge in the industry and in the sciences connected with the industry's development has been made available to the association by means of its many supervisory research committees. The membership of these committees includes approximately 540 individuals from the industry, 230 from Universities and Government research laboratories, and 120 from other industries.

Synthetic Liquid Fuel

British & American Research

UTILISATION before many years of oil shale, natural gas and, ultimately, coal as a source of liquid fuels because of the limited world reserves of petroleum oil, was referred to by Dr. C. C. Hall, of the Fuel Research Station, at a recent meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry held at Acton Technical College.

The occasion was the first joint meeting of the section with the newly formed Scientific Society of the college. Dr. C. W. Herd, who presided, expressed the good wishes of the R.I.C. for the future of the society and assured its members that the section would always be willing to assist in arranging meetings on chemical topics.

Reserves of crude oil, oil shale and natural gas within the British Commonwealth are very meagre, Dr. Hall pointed out, and interest here is mainly centred in the production of oil from coal.

Where there was a big demand for smokeless solid fuels, low-temperature carbonisation of coal provided a source of liquid fuels, but where liquid fuels were required as the main product the only processes available were coal hydrogenation and the Fischer-Tropsch synthesis.

Three or Four Stage Process

In the past, the conversion of coal into high-grade petrol by hydrogenation was a three or four stage process operated at 250 to 300 atmospheres pressure and at temperatures in the region of 400 degrees C. The initial conversion of the coal to heavy oil and the conversion of this heavy oil or of crude coal tars to a vapourisable middle oil was effected in the liquid-phase using tin catalysts, and the conversion of this middle oil to motor or aviation fuel took place in two consecutive vapour-phase stages in the presence of fixed beds of granular, tungsten disulphide catalysts.

During the war years the Germans increased the operation pressure to 700 atmospheres making it possible to use two stages, one liquid phase and one vapour phase, and to employ cheaper catalysts. Since the war, only the United States Bureau of Mines had been active in further research and development on the coal hydrogenation process. It had recommended improvements which should materially increase the thermal efficiency of the process and had carried out experimental work on a simplified form of process in which a fluidised bed of fine coal is hydrogenated at pressure as low as 70 atmospheres.

Coal hydrogenation had been used in the past mainly to produce various grades of petrol as the sole liquid products. Nevertheless it possessed considerable flexibility and could be operated to produce heavy fuel oil as the major product. Moreover, it formed a more fruitful source of aromatic hydrocarbons, phenols and bases for use in the chemical industry, than did coal carbonisation.

Fischer-Tropsch Synthesis

The Fischer-Tropsch synthesis of liquid hydrocarbons from carbon monoxide and hydrogen was extensively employed in Germany during the war years with coal as raw material and had recently been industrialised in America with natural gas as the raw material. The process was the subject of an extensive programme of research by the U.S. Bureau of Mines and by the Fuel Research Station of the Department of Scientific and Industrial Research.

In the original German process, a granular cobalt catalyst was employed at atmospheric pressures and at 180-200 degrees C., in reaction vessels of complicated construction and very low space-time yield. The products consisted of low-grade petrol, high-grade Diesel oil and waxes.

Modern developments, however, employed iron catalysts at higher temperatures and pressures making possible the production of higher yields of higher-grade petrol and conferring an overall greater flexibility on the process.

The use of the fluidised-catalyst technique and of reaction systems where the catalyst was in direct contact with liquid cooling medium had led to simplification of reactor design and had greatly increased space-time yields. In addition to liquid fuels, the process could be used to produce a wide range of aliphatic chemical products.

The modernised Fischer-Tropsch process

was generally considered at the present time as more economic than hydrogenation for the production of petrol from coal. This view, however, was not shared by the U.S. Bureau of Mines and in a future where coal was to be used as the main source of liquid fuels and chemical products it appeared likely that both processes would be utilised.

The chairman started the questions by asking the speaker for information on the production of chemicals from coal, as opposed to fuel from coal.

More Economical than Hydrogenation

In reply, Dr. Hall stated that for the production of chemicals the Fischer-Tropsch process would probably prove more economic than hydrogenation. However, it must be remembered that, for commercial success, chemicals produced from coal must be produced at a price which compared favourably with similar chemicals produced by petro-chemical processes. Taxation and duty would also have to be taken into account.

Asked by Mr. S. J. W. Pleeth about the exploitation of naturally occurring tar-sands as a source of liquid fuels, the speaker said that they were being investigated and also referred to the Alberta oil deposits which were, as yet, far from being fully developed.

In a second question, Mr. Pleeth asked for further details of the economics of the production of liquid fuels from coal in South Africa. It had been stated that the project would be economical with South African coal at 5s. per ton. What would happen if the cost of coal increased due, say, to raising the standard of living of miners in South Africa?

Dr. Hall explained that in South Africa the mines were relatively shallow with thick seams. The coal was, therefore, more easily won than in this country.

It was considered that future increases in the wages of the South African miner would be offset by increased mechanisation so that more coal would be won by higher paid miners and the overall effect would be to keep the price of coal around the figure of 5s. per ton.

Production of margarine by the Germans from hydrocarbons, derived from the Fischer-Tropsch process, during the war was the subject of the next question from Dr. J. H. Skellon who asked if the D.S.I.R. was following up this use of synthetic organic materials derived from coal.

This field, replied the speaker, was not being investigated. Firstly, because the margarine so produced was medically unsatisfactory, and secondly, its production in this way was uneconomic.

A question by M. D. Freeland about the possible use of the lush vegetation of the tropics as raw material for the production of liquid fuel—say, alcohol by fermentation, was considered of interest by Dr. Hall. He pointed out, however, that very large plants would be required and such a process would create a tremendous effluent problem.

Mr. A. G. D. Emerson asked whether it was possible to use the heat generated in the Fischer-Tropsch process to provide the heat and power necessary for running the auxiliary equipment of the plant without 'topping up' with energy from an external source, such as a boiler plant.

Thermal efficiency of the actual production by the Fischer-Tropsch process, replied Dr. Hall, was only 20 per cent, whereas the overall efficiency, including such items as steam-raising by waste heat boilers, was approximately 55 per cent. In Germany it had been found possible to make the plants thermally self-containing.

New Sulphur Recovery Process

RECOVERY of elemental acid-grade sulphur from surface deposits by a new refining process is reported by the Chemical Construction Corporation, New York, a subsidiary of the American Cyanamide Company.

The method involves the grinding of native sulphur-bearing ores to below 28 mesh size and suspending the fines in water. The mixture is then heated to above the melting point of sulphur to separate it from the gangue. After cooling, the final mix is subjected to froth flotation. Sulphur is floated off with the froth and filtration yields a product ready for acid manufacture. Relatively simple equipment comparable with the well-known Frasch process is employed and an effective sulphur recovery of 90 per cent or more is claimed.

Should Chemical Construction Corporation's new process live up to its preliminary expectations it will spell the utilisation of large surface deposits of sulphur-bearing ores throughout the world, and it should prove considerably cheaper than a pyrites acid plant as a sulphuric acid producer.

Training Engineers for Chemical Industry

Short Course to Illustrate Working Principles

ADVANTAGES of a short course of ten simple experiments as a method of supplementing the knowledge of newcomers to the chemical industry were outlined by W. F. Carey, M.Eng., M.I.Mech.E., engineering division manager, Alkali Division, Research Department, I.C.I., Ltd., in an Education Group paper delivered to the Institution of Mechanical Engineers at a general meeting in London on 2 March.

In his introduction, Mr. Carey said that the mechanical engineering curriculum seemed to have grown out of experience gained in the fabrication of all sorts of objects; the manner in which all engineers were trained in strength of materials, theory of machines, drawing and design, was a reflection of this. As the industry had grown the curriculum had been enlarged to include subjects such as heat engines, hydraulics, steam turbines. This method of education certainly allowed manufacturers to design such appliances so that their performance could be closely guaranteed.

However, a large proportion of mechanical engineers served a newer group of industries known as the process industries (chemicals, iron and steel, foodstuffs) as well as the manufacturers of the machinery involved in these industries (grinding mills, heat exchangers, driers, dedusters), where the precision of design was as yet comparatively low. Owing to the lack of a proper understanding of the principles involved, expensive over-design was common. Fundamentally, no greater knowledge was required than was obtained in most pre-university instruction in physics and chemistry.

Demonstrative Experiments

The methods of translation of these principles into engineering devices, however, were new, and the necessary instruction could be obtained from simple experiments chosen to illustrate the laws governing the transfer of heat, the analogous process of the transfer of matter and the settling of small particles in a fluid under gravity or centrifugal action. These experiments could best be included in the university curriculum as an interim measure, or, because it may be undesirable to extend the experimental course, suitable experiments could be devised for the new entrant into the process industries.

A substantial proportion of the graduates in mechanical engineering found their way ultimately into process industres, so called because they process commodities such as sugar, iron and steel, chocolate, plastics and chemicals in general, or serve the manufacturers of the machinery involved in these operations, for example, mills, classifiers, heat exchanges, and driers.

This high proportion probably reflected their economic importance and their need for the best advice upon the fabrication of machinery. Another peculiarity of the process industries was the dearth of precise information, so that in order to ensure a given result chronic 'over-design' was tolerated.

Modified Training

In the chemical industry the traditional method with young engineers had been to allow them a year or so to find their feet, but this wasted time and tended to consolidate existing practice, in that minds became ossified against inquiry into the underlying principles.

During the last few years in parts of Imperial Chemical Industries, Ltd., a course of one month's instruction had been given to freshly joined staff. This consisted of ten simple experiments designed to bring out the underlying principles upon which the design of the more important types of machine rested.

The ten experiments, which were described in detail, were: (1) pressure drop in valves; (2) heat transfer in forced convection; (3) matter transfer limited by diffusion in the gas film; (4) de-aeration of tap water; (5) grid-packed water-cooling tower; (6) size distribution of a powder; (7) sampling of dust suspended in a gas; (8) grade-efficiency curve for a cyclone; (9) energy for free crushing; (10) use of an eliminator for measuring spray fineness.

Expensive equipment was not required for these experiments, neither was their execution difficult. Allowing a day for practical work and a day's writing for each one, the course would take about four weeks.

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Accurate Oxygen Analysis

Improved Alkaline Pyrogallol Method

ONE of the most important reactions in gas analysis believed for many years to be subject to unavoidable errors, has been found dependable by chemists of the U.S. National Bureau of Standards when a few simple conditions are met. The analytical absorption of oxygen by alkaline pyrogallol was previously rendered inaccurate by the formation of carbon monoxide in unpredictable quantities. Investigation of the problem by Marthada V. Kilday, of the Bureau staff, has resulted in a procedure which improves the accuracy of the analysis.

The first step in the investigation was the selection of a suitable method for measuring the amount of carbon monoxide formed in any one reaction. Only when this was known could the conditions causing the production of carbon monoxide be found and corrected. For this purpose, the U.S. National Bureau of Standards' Carbon Monoxide Indicator (quantitative), developed during World War II, proved particularly suitable.

A modification of the Shepherd gas analysis apparatus was used for the test reactions. Oxygen in known mixtures was absorbed in pyrogallol, and the residue was passed through the indicator. Here the amount of carbon monoxide was determined so that corrections could be made for it in the final computations. The greatest source of error was found to be the method of preparing the pyrogallol solution. Heat produced by the reaction, if not carried away immediately, resulted in the formation of carbon monoxide in unpredictable amounts.

Improving Factors Listed

As a result of this work, the accuracy, reproducibility, and rapidity of the determination of oxygen by absorption in pyrogallol may be improved under the following conditions:—(1) Solutions can be prepared that evolve no significant amount of carbon monoxide during the analysis. This is accomplished by the direct addition of a saturated solution of potassium hydroxide to pyrogallol crystals while the reaction vessel is immersed in iced water and closed to the atmosphere. (2) Samples having partial pressures of oxygen higher than 50 per cent can be analysed with the improved solutions without dilution of the sample. (3) A pipette that disperses the gas in fine bubbles through at least 18 cms. of solution is preferable. (4) The rate of flow of the sample into the pyrogallol should be as rapid as possible and never less than 20 ml. per minute. (5) The temperature of the pyrogallol reagent should not exceed 30°C. during absorption. (6) If high accuracy is desired, the solution should not be used for analysis after 12 volumes of oxygen have been absorbed per volume of solution.

Raw Materials Conference

NINE other countries accepted the invitations of Britain, France and the U.S.A. to join them on the first committee of an organisation to set up international machinery for collaboration against the growing shortage of many materials.

The other countries were Australia, Belgium (for Benelux), Canada, Chile, the Federal Republic of Western Germany, Italy, Mexico, Norway and Peru.

Known as the International Materials Conference, the new organisation's first meeting in Washington was concerned with copper, zinc and lead supplies.

Members of the central group of the I.M.C. are M. Raoul de Vitry (France), Viscount Knollys (U.K.), and Mr. Edward T. Gibson (U.S.A.).

The first meeting of the sulphur committee was held in Washington on 1 March. Countries taking part were: Australia, Belgium (for Benelux), Brazil, Canada, France, Italy, New Zealand, Union of South Africa, U.K., U.S.A.

Other meetings arranged, and countries which had accepted invitations to participate were as follows:—

Cotton and Cotton Linters (5 March): Belgium (for Benelux), Brazil, Canada, Federal Republic of Germany, France, India, Italy, Mexico, Peru, U.K., U.S.A.

Tungsten and Molybdenum (8 March): Australia, Bolivia, Brazil, Chile, Federal Republic of Germany, France, Portugal, Spain, Sweden, U.K., U.S.A.

Manganese, Nickel and Cobalt (12 March): Belgium (for Benelux), Brazil, Canada, Cuba, Federal Republic of Germany, France, India, Norway, Union of South Africa, U.K., U.S.A.

Wool (2 April): To be announced later.

Chemicals and Dollar Exports

Value of the Caribbean Zone Countries

NEW inspiration to exporters at a time when they are harassed by shortages of raw materials and pressure of competing armament needs was the main result of the Dollar Convention held at Eastbourne last week at the invitation of the Dollar Exports Board.

The important part played by the chemical industry was referred to by Mr. Harold Wilson, President of the Board of Trade, at the conclusion of the convention. In the second half of last year, he declared, shipments of raw materials, chemicals and metals, and their semi-manufactures accounted for a quarter of our total exports to North America.

Problems Confronting Exporters

Problems confronting exporters to other dollar markets are also of vital importance and Mr. J. L. S. Steel, overseas development director of Imperial Chemical Industries, Ltd., and director of I.C.I., of Australia and New Zealand, Ltd., gave an account of the experience of his company in exports to those dollar countries bordering on the Caribbean Sea, from Mexico in the North, through Central America to Colombia and Venezuela in the North of South America.

A wide range of materials, from heavy chemicals to dyestuffs, pharmaceuticals, industrial explosives and non-ferrous metal products was being exported by I.C.I., said Mr. Steel. None of these fell within the conventional idea of capital or consumer goods, but were something in between.

Exports to these countries from the U.K. is a trade of long standing (Mr. Steel continued), and for many years we have exported heavy chemicals to practically every one of these countries. It is probably true to say, however, that they have not received on our part the full attention they deserve, and the necessity of earning dollars has recently focussed much more attention on them than they previously got. I think there has been for too long a general tendency to regard them as natural markets for American products rather than for British, due in part to the fact that the exports from these countries have been overwhelmingly to the United States, and to the relative nearness to American ports.

It is true, of course, that exports from the United Kingdom to these countries raise a lot of special problems. First of all there is a very large number of small countries to deal with. It is obviously impossible for any exporter from this country, however big, to maintain his own sales organisation in any substantial number of them. He has to deal with agents, and it is not always easy to find active and competent ones. There are some fourteen separate countries concerned, and the problem of visiting and supervising agencies is not an easy one. Nevertheless, the potentialities of these markets, taken as a whole, are quite considerable. The 14 or so countries between them have a total population of about 60 million, and though they are mostly countries which are relatively undeveloped industrially, the population is growing, standards of living are rising, and they quite evidently offer a chance of substantial business. From the British point of view, too, it is possible to consider sales to these dollar account countries in conjunction with sales to the British West Indies, situated geographically right in the middle of them. It is this last named fact, indeed, which has been the basis of I.C.I. export efforts to the area.

Caribbean Zone Agency

Some years before the war we started an office of our own in Kingston, Jamaica, and called it the 'Caribbean Zone Agency Inspectorate." Its function was to supervise agents and to be the headquarters of staff who toured all our agencies in the Caribbean Zone. It also formed the basis of a technical service organisation and dealt with any knotty problems which arose between the export sales side of our organisation in the U.K. and the agents. In addition it arranged necessary tours for sales and technical personnel from England who wished to visit agents or customers in the Caribbean Zone with the minimum waste of time. It is a commonplace, of course, to draw attention to the necessity for frequent visits by exporters to their agents and customers overseas. Without it satisfactory and continually growing business is impossible. In spite of the development of air services it is not too easy, without grave waste of time, to visit any number of these Caribbean Zone countries. We have found

that the existence of our own organisation in Jamaica, with staff there knowledgeable regarding all the difficulties of travel, has been of immense assistance.

In the twelve months before devaluation we exported to the dollar markets in this area I.C.I. manufactures to a value of approximately £370,000; as a result of devaluation our competitive position improved very materially and we made a special effort as part of the "Dollar Drive" along with steps to export larger quantities to the United States and Canada. A number of our representatives from the U.K. visited these territories after devaluation, and in the 12 months following devaluation, that is to say, the 12 months ending 30 September 1950, I.C.I. exports rose to a figure of about £1¼ million, some three and a half times the pre-devaluation figure; they were at an even higher rate during the year 1950 itself. It is of interest to note that this increase was approximately the same proportionately as the increase in our exports to the United States and Canada.

Progress in India

Two More Research Laboratories

THE rapid progress of science in India is exemplified by the new Metallurgical Laboratory recently opened in Jamshedpur. This laboratory was first conceived in 1940, and thanks to generous financial help from the Indian Government and the Sir Ratan Tata Trust, as well as Sardar Bahadur Sir Indra Singh and others, the scheme has finally been brought to fruition on 26 acres of land donated by Tata Industries Ltd. The opening by the Prime Minister of India was impressive. The laboratory's scope includes fundamental and applied metallurgical research on ores, minerals and refractories, as well as providing facilities for research on metallurgical furnace design. Statistical studies, chemical analysis, physics, the treatment of ores and alloys, metal structure, processing, electro-deposition, and corrosion are but a few of the subjects the laboratory intends to cover.

Indian conditions are naturally peculiar to the country, and this together with the fact that her mineral resources are vast—aluminium, iron, magnesium, titanium and manganese are the main metals present—make the establishment of this laboratory of the first importance. Lithium, that essential metal for the production of the tritium required for atomic bombs, is also present in good quantities, and as the opening speech of Dr. S. S. Bhatnagar showed, scientific progress in India has not been slow in implementing the bounties of nature.

Evidence of Indian research progress is also given by the recent opening at Mysore of the Central Food Technological Research Institute. Food in India, as the Bengal famine of 1943 and countless other similar disasters have shown, is of paramount importance to her peoples. This institute will cover storage, processing, improvements in food; the implementation of existing food supplies, the preparation of food accessories such as vitamins; preservation, dietectics, food sanitation, and the study of many other subjects to do with food. Only by constant research and organised distribution will India overcome the shortcomings in her natural supplies of foodstuffs, and this Institute is a very promising step in that direction. Its inception, together with that of the metallurgical laboratory mentioned above, are described in two pamphlets recently issued by the Council of Scientific and Industrial Research, New Delhi.

Lead Mine Taken Over

THE disused Van lead mines, near Llanidloes, have been bought by the managing director of the recently formed Ceiriog Metal Company. The firm hope to extract lead from the slag heaps and in the summer when the mines are less flooded to make a survey to see what can be done. At the recent sale of Plas Machynlleth properties, the Van mines were withdrawn after one bid of £5. The mines were last worked in 1920, though from 1920 to 1925 a paint manufacturing company used material taken from the slag heaps. The new company, a subsidiary of the Oakland Metal Company, Derby, are also to build an experimental plant near Machynlleth to recover aluminium from aluminium foil. This plant has been designed by Mr. R. F. McCarvell, secretary of the company, who said on February 16 that never before had such elaborate safety precautions been taken for the recovery of aluminium by this process. If tests prove successful, a full-scale plant will be built and there will be work for about 70 people and an output of five tons a day.

Newsprint Output Increases

New West Canadian Mill Will Help Ease Shortage

THE output of newsprint in British Columbia will be further increased when the Elk Falls Co., Ltd., opens its new plant now under construction. The mill is designed to have an initial output of 240 tons per day (75,000 tons per annum) with an estimated capacity of 320 tons per day (100,000 tons per annum).

The new company has been formed by Canadian Western Lumber Co., Ltd., and Pacific Mills, Ltd. The latter company operates a plant at Ocean Falls, B.C., with a capacity of 280 tons per day of newsprint and 210 tons per day of other products. Ninetyfive per cent of the voting stock of this company is held by the Crown Zellerbach Corporation of San Francisco.

The mill is situated at Duncan Bay, 100 miles northwest of Vancouver, close to pulpwood supplies and Government hydro-electric power. The site has ample waterfront suitable for deep water docks together with a natural sheltered harbour for booming logs. The climate is such as to permit all year logging and water transportation.

The lumber requirements of the mill will be 60,000 cords of pulpwood annually for ground wood pulp which they will obtain from Canadian Western Lumber Co., Ltd., and 12,000 tons per annum of chemical pulp which they will obtain from Pacific Mills, Ltd. This latter will be transported 200 miles by sea from Ocean Falls and represents 15-20 per cent of the total mill requirements, the ground wood pulp making up the other 80-85 per cent.

Government Hydro Power

Power for the plant will be obtained from a Government hydro-electric scheme which at present has a capacity of 112,000 h.p. and an estimated capacity of 198,000 h.p. The source of power is 2½ miles from the mill and under its existing contract the company may take 268,000 h.p. per annum.

Demand for newsprint continues to increase with the result that Canada's newsprint industry is operating at capacity. Canada is the world's largest newsprint producer with a capacity to produce some 5,250,000 tons per annum. Approximately 80 per cent of Canada's output including Newfoundland is exported to the United States, the world's largest consumer of newsprint, which has a capacity to produce only some 988,000 tons. In 1939 Canadian newsprint production was 3,175,000 tons compared with 5,176,000 tons in 1949, an increase of 2,000,000 tons or 63 per cent. The United States, England and Scandinavia, the other major newsprint producing countries each produced less in 1949 than in 1939.

73 per cent Output Increase

In British Columbia, newsprint production was 216,540 tons in 1939 compared with 376,000 tons in 1949, an increase of 73.6 per cent. Of the newsprint produced in British Columbia in 1949, 85 per cent was exported to the United States, 8 per cent to overseas markets and 7 per cent sold in Canada. The newsprint exported to the United States from British Columbia was shipped to eleven states in which the consumption of newsprint in 1949 was approximately 720,000 tons compared with the productive capacity of 290,000 tons per annum of newsprint plants in Oregon and Washington, the only states in the eleven in which newsprint is produced.

Underlying the increased demand in the past ten years for newsprint produced in British Columbia, is the growth in population in the Pacific Coast area of Canada and the United States. The combined population of the Province of British Columbia and the eleven Pacific coast and western states in which British Columbia newsprint is sold, has increased in the ten-year period from 1940 to 1950 by approximately 39 per cent to an aggregate of over 20,000,000. During this period, the population in Canada has increased over 18 per cent and in the United States over 14 per cent.

The output of this new mill has a guaranteed market since the Crown Zellerbach Corporation has guaranteed to purchase a minimum of 60,000 tons per annum of newsprint for ten years.

The new plant is a one-machine newsprint mill which is expected to commence operation by 1 December, 1952. The estimated cost of construction is $16,525,000 or £3,508,333.

Technical Publications

THE LATEST report on American productivity has been published by the productivity team from the rigid boxes and cartons industry, which went over there in January 1950. The report contains a general survey of industrial incentive schemes, labour relations, and production, and a more technical section with plates showing the American methods of printing, cutting and creasing, stripping, gluing, and handling cartons and boxes, the machines in use, and lessons to be learnt from them all.

'COLONIAL Geology and Mineral Resources,' the quarterly bulletin of Colonial Geological Surveys, has just issued Volume 1, Number 2, from HMSO. The first article is a summary of the geological features of Northern Rhodesia, and the work involved in mapping them. Over 210,000 ft. of prospecting pits were sunk within the so-called Copper Belt alone. The results show that there is abundant copper ore, mostly of 4 per cent copper, but some of 7 per cent, available; some iron pyrites with 20 per cent sulphur, and zinc, lead and vanadium; as well as iron, manganese and graphite which remain to be surveyed. The rest of the bulletin comprises laboratory investigations of mineral resources, and reports from the geological surveys of other African territories.

AN INTERESTING addition to the ever-growing field of standardisation of materials and equipment is now available in the Royal Institute of Chemistry's Symposium on 'Standardisation in the Chemical Field.' It contains articles on the standardisation of materials, of analytical methods, of apparatus, and on the preparation of the standards themselves. The number of different specifications required in all fields of chemistry, the multitudinous requirements of purity of material, the incessant demands made by changing or developing technique all combine to make the standard-maker's job a difficult one. The results, however, when they do come out, are of lasting value.

'CHEMICAL TECHNOLOGY' is the title of a new booklet in the Readers' Guide series of select bibliographies now being published by the County Libraries Section of the Library Association. This volume (No. 9), which gives a selection from the wide and rapidly growing literature of chemical technology, does not represent the stock of any one particular library, but sets out to give some representative works on the subject. It is divided into two sections. The first, general, deals with general and reference works; chemicals; chemical engineering plant and processes; physical chemistry, thermodynamics and applied mathematics. The second section deals with various industries.

AUTOCLAVES and reaction vessels have to work at a wide variety of temperatures and pressures making it impossible to standardise on one or two designs. Nevertheless, the chemist, chemical engineer and research worker is handicapped by the lack of information published on the variety of designs available as standard items. With this in mind the Kestner Evaporator and Engineering Co., Ltd., have issued a leaflet (No. 284) describing the three principal types of autoclave and reaction vessel, namely, direct heated, jacketed and internally heated units, which it has developed.

LANOLIN (Wool wax), its properties, analysis and wide variety of application is the subject of a revised booklet issued by Croda, Ltd., Snaith, Yorkshire. Other booklets available deal with wool wax alcohol in cosmetics, medicine and industry; wool wax acids, and wool grease distillation products.

THE January and February editions of section C of British Abstracts on analysis and apparatus have just been issued. They contain between them 671 abstracts. Interesting selections among the inorganic section is the determination of water in fuels by the passage of β-rays; analysis of commercial tin with iodine (conversion to SnI_4); improved determination of graphitic carbon in cast iron; and new methods of determining the total hardness of water. Subjects in the organic section include the uses of polarography in the petroleum industry for the determination of lead tetraethyl in petrol, inorganic impurities in oils, etc.

The Chemist's Bookshelf

TEXT-BOOK OF ORGANIC CHEMISTRY: Louis. F. Fieser and Mary Fieser. (London: George G. Harrap and Co., Ltd.; Boston: D. C. Heath and Co., 1950). Pp. vi + 741. 35s.

Recently, the authors have published a second edition to their well-known treatise on organic chemistry; this present text-book is an entirely new and separate volume. It has been produced primarily for the student and, although designed on the same principles as its larger counterpart, it contains certain fundamental features which make it eminently suited for this purpose.

At the end of each chapter, there appears a summary of the items discussed, a set of questions and further reading references. These are most valuable.

A chapter (16 pp.) on heterocyclic compounds makes a welcome appearance, although from the student's viewpoint it is barely sufficient and more on this subject might well have been included.

The chapters on stereochemistry and ring formation are particularly lucid; those dealing with aromatic compounds are written with the authority of the specialist and provide a source of information unsurpassed by many more advanced texts. Carbohydrates, fats, proteins, dyes, synthetic fibres and plastics, physiologically active materials are all discussed in sufficient detail for the student, while leaving the more complex aspects of these subjects to the larger parent volume. Unfortunately, the authors have chosen to omit a chapter on isoprenoid compounds, although natural and synthetic polyisoprenes are discussed under 'rubber.'

The book is an extensive revision of the 1944 edition of 'Organic Chemistry' and contains much new material which brings the work up to 1949, while maintaining a most convenient size. The high standard of printing and binding, the admirable presentation of formulæ and the general neatness combine to make the whole a noteworthy publication. The authors have successfully compiled a text-book to assist the student and have provided him with a fascinating and most readable account of organic chemistry.—A.J.N.

THE MANUFACTURE OF INTERMEDIATES AND DYES. An Introduction to Works Practice. By G. H. Frank. London: Constable and Co. Pp. 177. 15s.

This book is designed to be an introduction to works practice in dyestuffs chemistry. The initial general notes in Part I give a very concise summary of the principles underlying choice of plant and works practice. These chapters might have been usefully extended. It is regrettable that the succeeding chapters are not up to the standard which is essential in a book written primarily for the young student whose knowledge and critical faculty are still unformed. There is no mention of the still important class of triphenylmethane dyestuffs. The classification of contents of various chapters might be improved; for example, J and gamma (γ) acids are included as the final items on naphthylamine sulphonic acids whereas they should fall into the succeeding chapter. The book contains some unconventional abbreviations. Quite unusual is the abbreviation Y acid for 2-amino - 8 - hydroxynaphthalene - 6 - sulphonic acid which is used throughout the book and in the index; the universal trivial name is gamma (γ) acid. Naphthol AS Bases (p. 72) are more usually termed Azoic Bases. There are many errors throughout the book and as a brief selection may be noted the confused error in the chemical name for Naphthol AS.G (p. 73) and the constitution of Naphthol AS.BS should be corrected to the m-nitranilide of β-hydroxynaphthoic acid. It is evident that the author has had little or no experience in the selection of material for a book or in setting out his material. The numerous inaccuracies suggest that the author would have been well advised to have had an independent proof reader.—H.S.

HOME

Authorised Capital £5,000

It has just been brought to our notice that in the 1951 CHEMICAL AGE YEAR BOOK The Process & Chemical Engineering Co., Ltd., is shown as having an authorised capital of £500. This should, in fact, be £5,000.

Barium Carbonate Prices

Laport Chemicals, Limited, have announced that the following price changes have just been put into operation: Barium carbonate (precipitated), £30 per ton in 2-ton lots; £29 15s. per ton in 4-ton lots.

Change of Address

H. T. Watson Limited, chemical and mechanical engineers, have moved to larger and better premises offering greater facilities. The official change-over occurred on Wednesday, 21 February, and the firm's present address is Croft Street, Widnes, Lancs. The telephone number is 2313. Overseas telegrams should be addressed: Watson, Widnes.

Oldest Press Guide

The centennial issue of Mitchell's Press guide, now known as the *Newspaper Press Directory*, was marked by a special luncheon held in London by Benn Brothers, Ltd., who purchased it in 1949 from the original founders, C. Mitchell & Co., Ltd. The work is presented in a new form with revised typography and classification. Its wide range has been still further extended, covering more than 1,500 newspapers and nearly 3,500 periodicals and journals.

Midlands Analytical Discussion Group

The next meeting of the Midlands Analytical Methods Discussion Group will be held on 14 March, at 7 p.m., in the Main Theatre of the University, Edmund Street, Birmingham. The discussion will be on 'Some Aspects of Boron Analysis' and it will be introduced by J. Davies, Head Analyst, Chance Brothers, and G. R. Ball, B.Sc., Research Department, Borax Consolidated, Ltd.

Change of Address

Pest Control, Ltd. announce that its publicity department has moved to Harston, Cambridgeshire. Telephone Harston 312.

Lab Glass for Sweden

Interchangeable laboratory glassware valued at some £1,200 has recently been supplied to the Biochemical Institute at Upsalla University, Sweden, by Quickfit and Quartz, Ltd., of Stone, Staffordshire, a subsidiary of the Triplex Safety Glass Co., Ltd. The order was placed by Professor Tiselius in competition with other countries including America. It was paid for in dollars by the Rockefeller Foundation.

Melamine Factory for Britain

The British Oxygen Company, Ltd. announces that the melamine plant which is being erected at Chester-le-Street, is likely to be in production in the latter part of this year. In the meantime the company is operating a small pilot plant which enables them to provide bulk samples for industry so as to help forward the work of process development between now and the opening of the new factory. Technical bulletins outlining the properties of melamine and describing the preparation of resins suitable for application in certain fields may be obtained on request.

Trade Mark Approved

'Elvira' has now been approved as the registered trade mark of the dry cleaning aid marketed by Shell Chemicals, Limited, and previously known as T.P. 656. There has been no alteration in the formula or properties of the product.

Blackwell's Lease Land

The Finance Committee of Liverpool City Council propose to sell to Blackwell's Metallurgical Works, Ltd., of Garston, Liverpool, four acres of land on the south-west side of Shaw Road, Speke, for 999 years at £120 an acre, to establish a factory for crushing, preparing and smelting mineral ores. There will be an anti-nuisance clause.

Duchess Sees Chemical Plant

The Duchess of Kent last week visited the Greenwich Metal Works of G. A. Harvey & Co. (London), Ltd. During the tour Her Royal Highness inspected the new extension to the fusion welding shop where she saw typical heavy industrial plant manufactured for the chemical and petroleum industries.

OVERSEAS

Chemical Plant Exhibition

It has now been definitely settled that ACHEMA X—Exhibition Convention for Chemical Plant, sponsored by DECHEMA, will be held from 18 to 25 May, 1952, in Frankfurt am Main, in eight halls of the Frankfurt Fair and Exhibition grounds.

New U.S. Tinplating Technique

Savings of up to 50 per cent in the use of tin are claimed for a new tinplating technique recently perfected by the Weirton Steel Company, West Virginia, a subsidiary of the National Steel Corporation. Under methods in general use tinplate receives the same weight of coating on both sides. In the Weirton process one side is coated sufficiently to protect the contents of the can, while the other side is treated with only the amount of tin necessary to protect the exterior from exposure.

South African Oil Refinery

Official confirmation was announced last week by Mr. Louw, Minister of Economic Affairs, that the Vacuum Oil Company of South Africa will erect an oil refinery at Wentworth, Durban, costing £4,500,000. Work will be begun early next year and production is expected to start at the end of 1953 or early in 1954. About 125 million gallons of crude oil will be treated yearly. The refinery will be operated by the Standard Vacuum Refining Company of South Africa (Proprietary), capital being provided by the American company.

French Hot Rolling Mill

Europe's first continuous hot rolling mill has been completed at Denain (Nord.), France by the Usinor Company. More than two years was spent in installing 35,000 tons of American equipment in the giant mill, which is 1,500 feet long and 650 feet wide. Trial operations were started on 27 December, 1950, and eventually capacity is expected to be 800,000 tons of high-quality light plate and sheet steel. Such tonnage is sufficient to meet 70 per cent of the present French needs. Part of this tonnage will be re-rolled at Usinor's complimentary cold mill at Montataire (Oise). The Denain and Montataire projects were financed largely by Government funds with Marshall Plan aid.

Allocation of U.S. Chemicals

A general over-all allocation of chemicals expected to be shortly made by the U.S. National Production Authority. According to Mr. C. Concannon, of the N.P.A. Chemical Division, this would bring scarce chemicals under the most stringent form of control yet anticipated for any single class of material.

Aluminium Smelter Reactivated

A project to re-open the aluminium smelter at Beauharnois, Quebec, which has been idle since the war, is nearing completion by the Aluminium Company of Canada, Ltd. (Alcan). Some $3,000,000 has been spent on technological improvements. Arrangements have also been made with Hydro Quebec for the supply of 100,000 h.p. of hydro-electric energy insuring a supply of power until 30 November, 1953. New generating facilities at Beauharnois will enable Hydro Quebec to supply Alcan with sufficient power to produce some 32,000 metric tons of primary aluminium ingots annually.

U.S. Metal Production

The construction of an alloy production plant near New Haven in Mason County, W.Va., is announced by the Vanadium Corporation of America. The contemplated new plant is designed primarily for the production of silicon alloys, although its electric furnace installations will permit production of various other ferro-alloys used in the aluminium, chemical, steel, and manganese industries. In the chemical, ceramic and glass industries, these alloys enter as raw material into many manufacturing operations that employ catalysis as a basic method, and are used in the production of certain dyestuffs, coloured ceramic bodies and glazes, and glasses of special properties.

Reynolds Metal Company, New York, announce that plans have been largely completed and construction is due to get under way on an $80,000,000 plant near Gregory, Texas, in the Corpus Christi area. Some products from the plant, which has an annual capacity of 150,000,000 pounds, will be obtainable before the end of the year, it is indicated.

Next Week's Events

MONDAY 12 MARCH

Society of Chemical Industry

Leeds: The University, 6.30 p.m. A.G.M. 7 p.m. J. Wolf: 'The Control of the Bacterial Population of the Atmosphere.'

TUESDAY 13 MARCH

Chadwick Public Lectures

London: 90 Buckingham Palace Road, S.W.1, 2.30 p.m. G. V. B. Herford: 'Insect Infestation of Stored Foodstuffs.'

Chemical Engineering Group

London: Burlington House, Piccadilly, W.1, 5.30 p.m. I. Lubbock: 'Possible Applications of Gas Turbines in the Chemical Industry.'

WEDNESDAY 14 MARCH

The Chemical Society

Dublin: University College, Upper Merrion Street, 7.45 p.m. S. H. Bales: 'The Production and Applications of Radioactive Isotopes.'

Institute of Metals

Manchester: Engineers' Club, Albert Square, 6.30 p.m. H. G. Dale: 'Precious Metals in Industry.'

THURSDAY 15 MARCH

The Physical Society

London: 4 Grosvenor Gardens, S.W.1, 2.30 p.m. Discussion: 'Internal Friction of Solids.'

The Chemical Society

London: Burlington House, Piccadilly, W.1, 7.30 p.m. Reading of Original Papers.

Bristol: The University, 7 p.m. Dr. W. H. J. Vernon: 'Recent Progress in the Study of Metal Oxidation and Corrosion.'

Edinburgh: North British Station Hotel, 7.30 p.m. Dr. N. P. Inglis: 'Some Observations on Materials of Construction for Chemical Plants.'

Manchester: The University, 10 a.m. Symposium: 'The Chemistry of Cell Division.'

The Royal Society

London: Burlington House, Piccadilly, W.1, 4.15 p.m. Election of Fellows. Two papers will be read and discussed.

FRIDAY 16 MARCH

The Royal Institution

London: 21 Albemarle Street, 9 p.m. Sir Lawrence Bragg: 'Crystallographic Research in the Cavendish Laboratory.'

The Chemical Society

Birmingham: The University, 4.30 p.m. Professor H. J. Emeléus: 'Some Recent Advances in the Chemistry of Fluorine Compounds.'

River Pollution Curbed

After a very long period of comparative freedom, Scottish firms using rivers for the discharge of trade effluent are likely to be severely curtailed in the near future as a result of action to be taken in Parliament on the lines of a recent investigation into the subject. Much closer control of effluent is likely to be required, in which case many firms may be placed in a difficult position owing to the cost of installing purification plant, and, indeed, to the fact that adequate space may not be available if the area is a built-up one. The length of time allowed for adjustment to the new schemes will probably, however, be quite great.

Coal Distillation at the Pits

The installation of distillation plant to prevent uneconomic pits from being forced to close down is being considered by the N.C.B. and Miners' Union in Scotland. Lanarkshire is the area advocated, but the scheme should be regarded with caution as the coal there has not been tested for suitability by the engineers concerned, and the Scottish Council (Development and Industry) have already turned down the idea of distillation in Lanarkshire as uneconomic (2,000 tons per day would be required to make the plan worth while).

Services Continued

Following the death last month, after a prolonged period of ill-health, of Mr. David Brownlie, it is announced that the service of engineering consultants will be continued by F. and D. Brownlie from the same address.

PERSONAL

The gold medal of the Society of Dyers and Colourists has been awarded to MR. H. FOSTER, who has been secretary of the West Riding branch for 15 years. The presentation will be made by the society's president, MR. FRED SCHOLEFIELD, at a dinner in Bradford on 6 April

MR. E. H. HURLESTON, F.I.R.I., superintendent of technical services at Dunlop's Speke factory, has been appointed its factory technical manager in Manchester. He will be succeeded at Speke by MR. W. A. CLARKE, technical manager of precision components.

DR. JAMES GRAHAM MARTINDALE, B.Sc., A.Inst.P., F.T.I., principal of the Scottish Woollen Textile College, Galashiels, a member of the council of the Textile Institute, is to be awarded its Warner Medal in recognition of his outstanding work in textile science and technology, the results of which have been published, particularly in the institute's journal. The presentation will be made at the annual conference dinner to be held at Brighton on 22 May.

DR. JOHN F. THOMPSON, president of The International Nickel Company of Canada, was elected chairman of the board of directors, succeeding the late Robert C. Stanley, at a special meeting of the board in New York on 27 February. He continues as president, which office he has held since 7 February, 1949.

MR. GEORGE BISHOP JONES, the general works manager of Dalton Works (Imperial Chemical Industries, Ltd., Dyestuffs Division, Huddersfield) has together with his wife accepted the unanimous invitation of the Huddersfield Town Council to be Mayor and Mayoress of the Borough for 1951-52. The installation ceremony will take place in the Town Hall on 22 May. Mr. Jones, who is a F.R.I.C. and A.M.I.C.E., came to British Dyes, Ltd. (now I.C.I. Dyestuffs Division) at Dalton works in 1917 and in 1930 was promoted to works manager, becoming general works manager in 1948.

Among senior I.C.I. staff promotions recently announced are those those of MR. A. J. PRINCE to the board of I.C.I. Billingham Division, and of Mr. S. Howard to the board of I.C.I. Dyestuffs Division.

At a meeting of the board of directors of Scottish Agricultural Industries, Ltd., on 1 March DR. ALEXANDER FLECK, who had been chairman of the company since 1947, resigned from the board owing to the increasing burden of duties consequent on his appointment as a deputy chairman of Imperial Chemical Industries, Ltd.

SIR WILLIAM GAVIN, C.B.E., was appointed chairman in succession to Dr. Fleck. Sir William Gavin has been a director of the company since 1932 and in addition to being connected with the agricultural activities of Imperial Chemical Industries, Ltd., he is a director of The Agricultural Mortgage Corporation and of Strutt & Parker Farms, Ltd. He was educated at Uppingham and Trinity College, Cambridge.

DR. J. W. MCDAVID, C.B.E., chairman of the Nobel Division of Imperial Chemical Industries, Ltd., and DR. T. C. MITCHELL, deputy chairman of the Central Agricultural Control of I.C.I., were appointed additional directors.

Obituary

The death of MR. JAMES MACGREGOR, of Carrion Mills, chairman of James MacGregor, Ltd., Wishaw, removes one of the best known and most progressive men in the Scottish fertiliser trade. He was 72.

The senior vice-president of the MacGregor clan, Mr. MacGregor was chairman of James Gibb & Finch, Ltd., sulphuric acid makers, Plymouth, and of the Sulphuric Phosphate Manufacturing Co., Ltd., Devonport.

MR. BOB CARLISLE, who as a boy helped John Boyd Dunlop make his first pneumatic tyre, has died in Birmingham on his 86th birthday. Mr. Carlisle was associated with the first pneumatic tyre company in Dublin and joined Dunlop's general staff at Coventry in 1896.

The Stock & Chemical Markets

MARKETS started the week cheerfully with business again at a high level, particularly in the rubber and commodity sections. Later there was more caution, partly because of attention drawn to problems of shortages of materials arising from rearmament and stockpiling. At the time of writing some commodity prices, particularly tin, have turned easier on suggestions that the U.S. Government may now reduce stockpiling demands while prices are at current levels. This is, however, considered unlikely, although there are increasing expectations that before long there may very well be a system of international rationing of commodities essential to rearmament of the United Nations.

News of the sulphur shortage brought back rayon shares and chemical shares also lost ground. Courtaulds, following their big rise on higher dividend talk, receded to 41s., and British Celanese were 25s. Imperial Chemical have receded to 43s. 7½d. at the time of writing, Fisons to 27s. 3d., and Monsanto turned easier at 54s. 9d. F. W. Berk eased to 13s. 6d., Brotherton were 21s. and Laporte 5s. units 11s. 1½d., while W. J. Bush ordinary have marked 92s. 6d.

Borax Consolidated at 65s. have remained under the influence of the 100 per cent share bonus; but despite their bonus, United Molasses at 58s. 6d. reflected a little profit-taking. Turner & Newall were 89s., and Glaxo Laboratories 62s. Lever Brothers improved to 46s. 3d. on higher dividend hopes, and talk of more for shareholders also put General Refractories better again at 29s. 6d. On the other hand, British Glues eased further to 23s. 6d., while British Oxygen were 95s. English Electric at 60s. 3d. remained under the influence of the good results and higher dividend, while G.E.C. at 87s. 9d. held most of an earlier rise.

Associated Cement at 92s. 3d. have been quite well maintained in price, helped by market hopes of higher dividend prospects. British Plaster Board were slightly lower on balance at 14s. 3d., Goodlass Wall at 37s. 3d. have held up quite well, and Pinchin Johnson were 39s. British Aluminium at 42s. 9d. have also been well maintained, but elsewhere, Dunlop Rubber at 57s. 4½d. reflected profit-taking.

Triplex Glass at 25s. 3d. were little changed compared with a week ago. United Glass Bottle at 84s. 4½d. remained firmly held on hopes of higher dividend or bonus prospects. Clarke Chapman firmed up to 61s. 3d., while Guest Keen have been around 54s., the view persisting that there will be either a higher dividend or a special distribution of some kind arising from compensation for nationalisation of the group's steel interests.

Market Reports

LONDON.—Reports during the past week show that the overall demand for industrial chemicals continues at a high level both for home account and for shipment, with spot or near delivery business remaining difficult to negotiate. The effect of the shortage of sulphur is being increasingly felt and is causing a serious problem for many consuming industries. So far as prices are concerned the position generally is unchanged with quotations very firm. Changes received too late for last week's report record higher prices for barium carbonate, precipitated, barium sulphate, precipitated, and ammonium persulphite; while higher rates operative as from 1 April have been notified for 'Three Elephant' brand borax and boric acid, bringing these quotations into line with those now operating for the '20 Mule Team' brand. The non-ferrous metal compounds are in strong request with sulphate of copper now quoted at £74 17s. 6d. per ton less 2 per cent f.o.b.

Owing to the increased price of linseed oil, on 5 March, an increase of £2 per ton was made for white, red and orange lead ground in oil.

MANCHESTER.—The shortage of sulphur and sulphuric acid, especially, though a number of other chemicals are scarce, is causing increasing anxiety among the consuming outlets in and around Manchester and it is feared that before long it will be necessary to restrict production in several industries, in some instances to a notable extent. There has been a steady demand for all descriptions of heavy chemicals on the Manchester market during the past week. The undertone is firm in all sections, with a rising tendency. Blanc fixe and precipitated carbonate of barium are dearer by £3 15s. and £1 15s. per ton, respectively.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Receivership

ROBERTS ORME & CO., LTD., chemical manufacturers, Barton Street, Bristol 2. (R., 10/3/51.) Mr. C. H. Maggs ceased to act as receiver on 20 February, 1951.

Company News

Borax Consolidated, Limited

Consent of the Treasury has been received to capitalise £1,500,000 from the undistributed profits and reserves of the company by the issue to the holders of the existing deferred ordinary stock of 1,500,000 fully paid deferred ordinary shares of £1 each in the proportion of one such share for each £1 stock held. An extraordinary general meeting will be held immediately after the annual general meeting on Monday, 2 April 1951, to consider and, if thought fit, to pass the requisite resolutions for the issue.

After a steady decline since 1946-1947, the profits of Borax Consolidated, Ltd. group for the year ended 30 September, 1950, showed a remarkable advance. The parent company's trading profit of £1,637,537 was more than double the figure of £809,686 for 1949. A final dividend of 8½ per cent is proposed on the ordinary shares as against 6 per cent in the previous year. Bonus proposed is again 2½ per cent, making with the 4 per cent interim dividend a total of 15 per cent compared with 12½ per cent in 1949.

I.C.I. of Australia and New Zealand

A profit of £986,509 for the year ended 30 September, 1950, was shown by Imperial Chemical Industries of Australia and New Zealand, Ltd., compared with £701,873 for the previous year. Dividend on ordinary shares was raised from 5 to 5½ per cent.

Triplex Forms Estates Company

Triplex Estates, Ltd. (capital £100) has been formed to take over all property other than factory premises owned by the Triplex Safety Glass Co., Ltd., and its subsidiaries. The property includes houses in London and Birmingham and also at Stone, Staffs., which is the location of the works of Quickfit and Quartz, Ltd., manufacturers of laboratory glassware, a wholly owned subsidiary. This new company will manage and administer all the properties, and it is hoped to build flats for the workers at Stone, subject to a permit being granted. The chairman is Mr. Arthur Cochrane, M.I.M.E., assistant managing director of Triplex Safety Glass Co., Ltd. Other directors are Mr. J. W. Follett and Mr. C. L. Cripps, both directors of the parent company. Secretary is Mr. S. F. Ockenden.

Changes of Name

The following changes of name have been announced: F. Haworth (Acid Resisting Cement) Ltd., F. Haworth (A.R.C.) Ltd.; Kingsley Chemicals Ltd., Kingsley Proprietaries (Midlands) Ltd.; Phillips Spencer, Dakers & Co., Ltd., Evans Medical Supplies (Northern) Ltd.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

ANALYTICAL CHEMIST, A.R.I.C, B.Sc., A.I.R.I., or equivalent required by well established Company in Croydon area. Pensions Scheme, canteen, Sports and Social Club. Applicants should be under 26. Commencing salary £450–£525 p.a., depending on qualifications and experience. Particulars to Box No. C.A. 2994, THE CHEMICAL AGE, 154 Fleet Street, London, E.C.4.

ANGLO-American Company producing cellulose for the chemical and allied industries, require a **QUALIFIED CHEMIST** for laboratory and process control work. Experience in our field not necessary. Age 20–30. Salary not less than £500. Applications, giving full details of education and qualifications to: CHIEF CHEMIST, The Holden Vale Manufacturing Company Limited, Haslingden, Lancashire.

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